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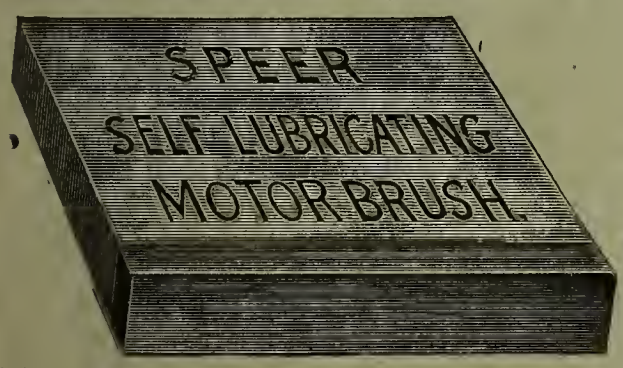
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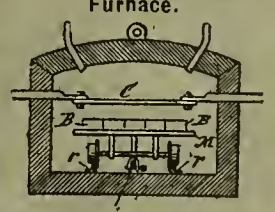
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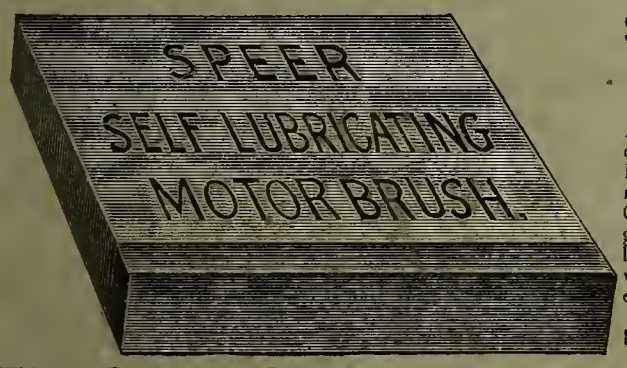
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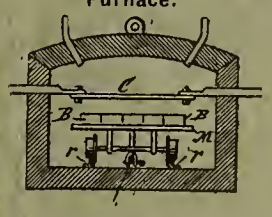
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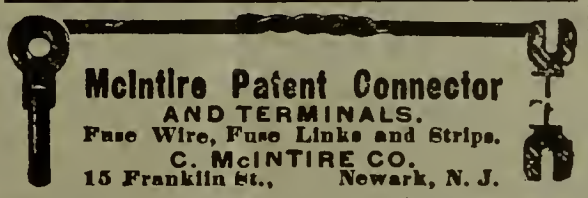
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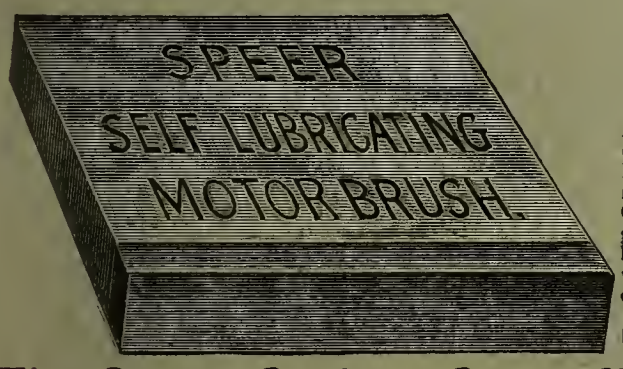
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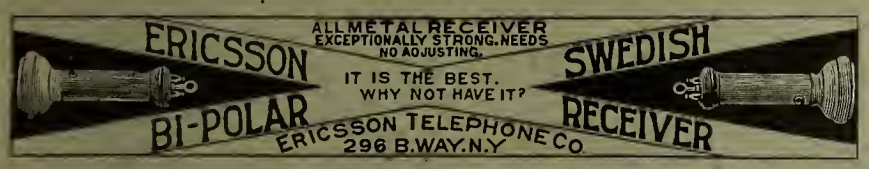


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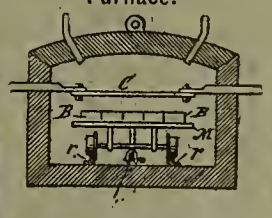
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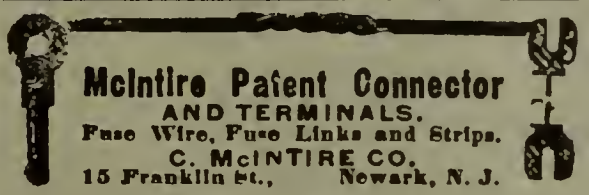
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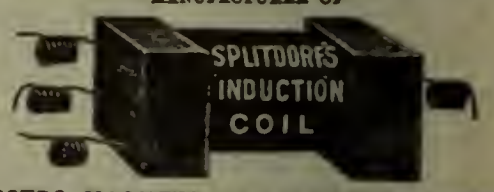
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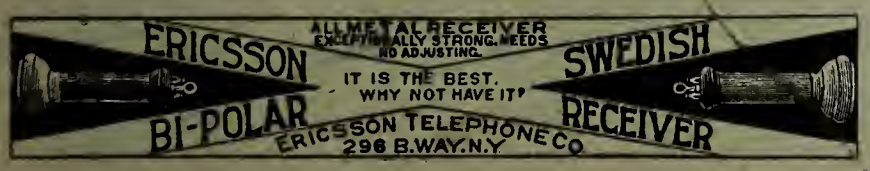


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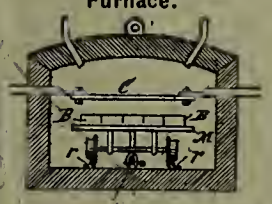
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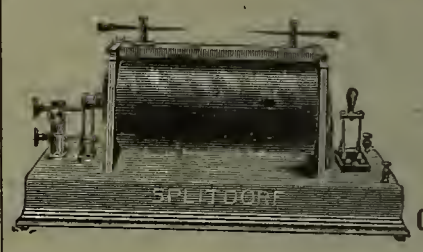
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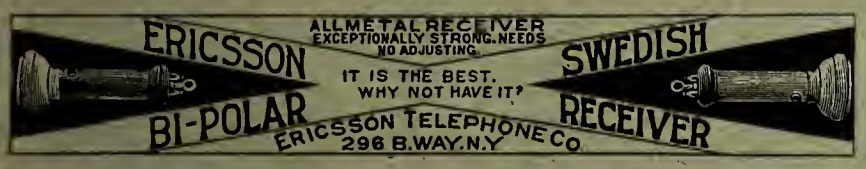
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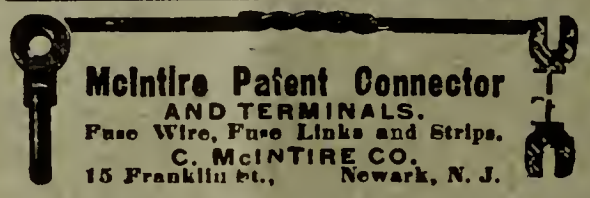
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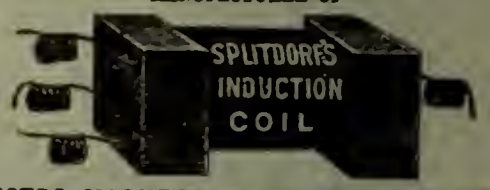
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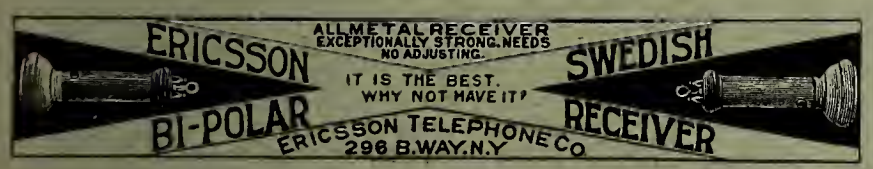
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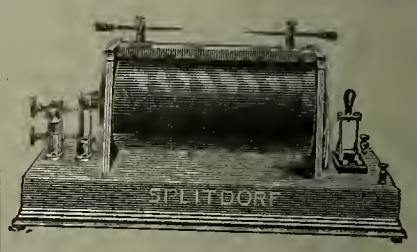
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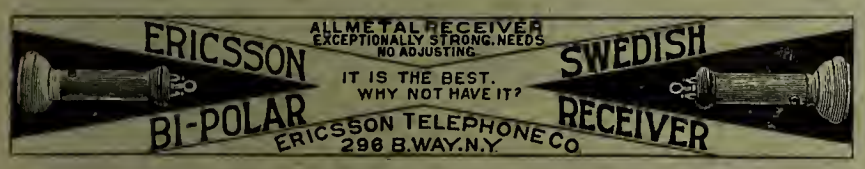
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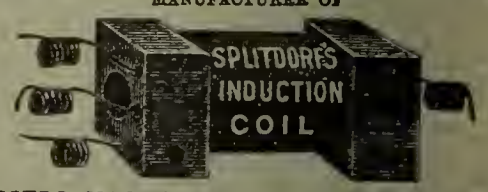
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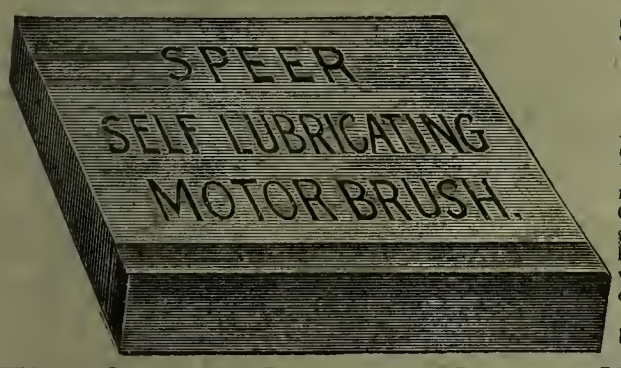
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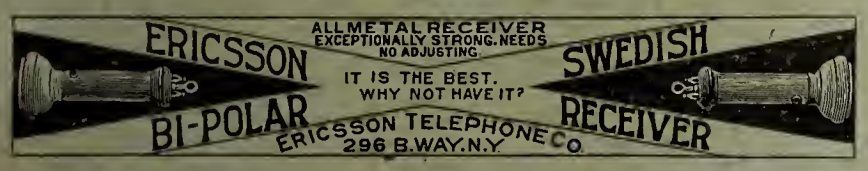
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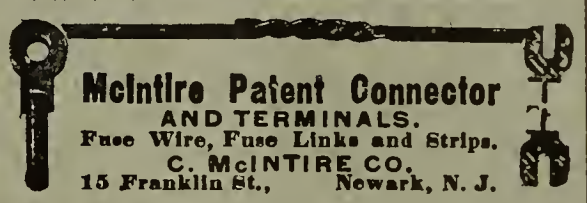
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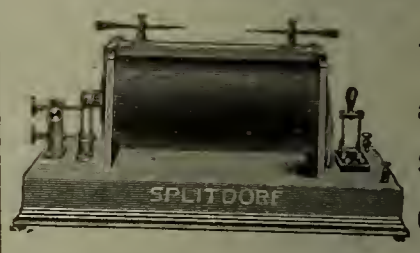
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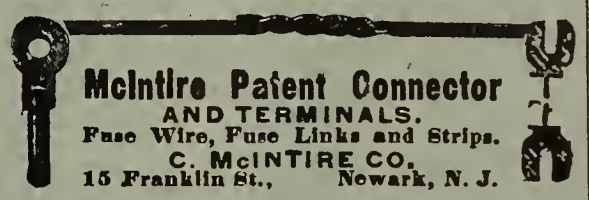
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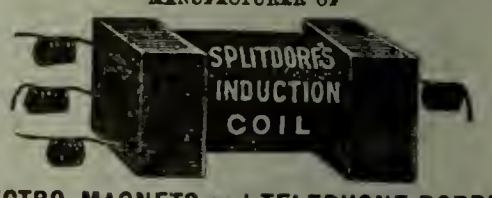
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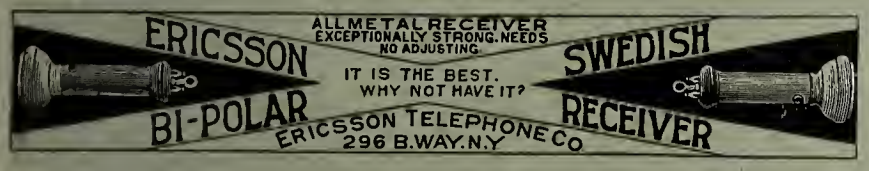
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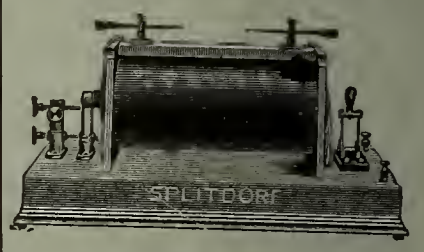
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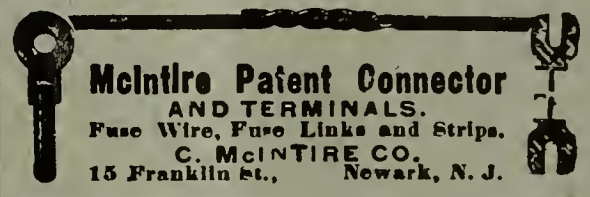
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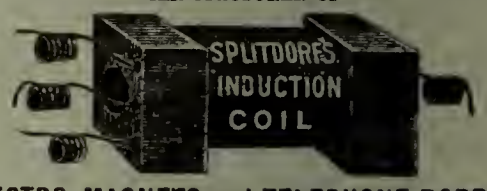
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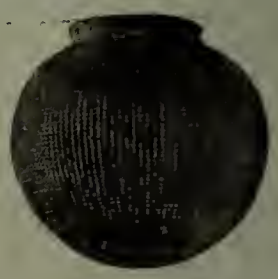
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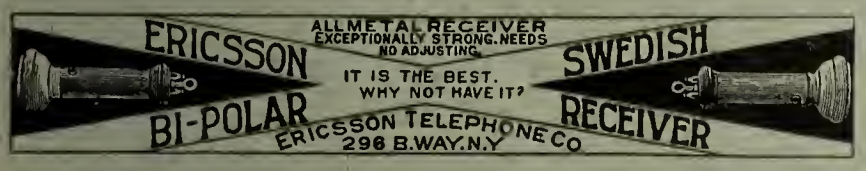
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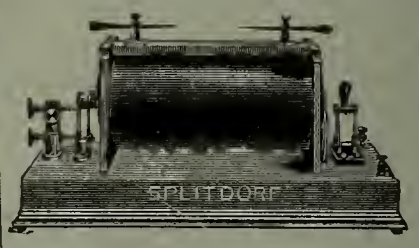
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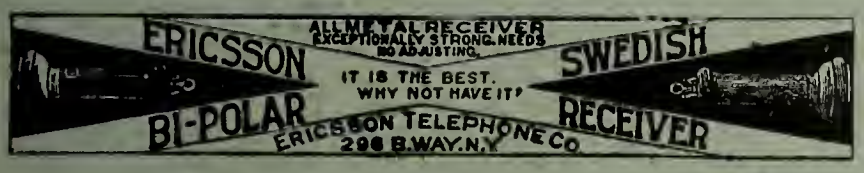


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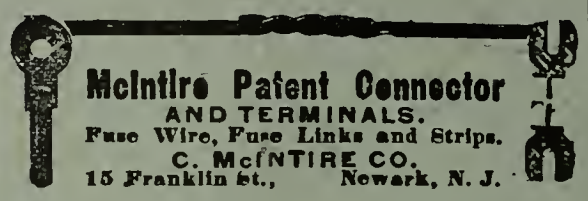
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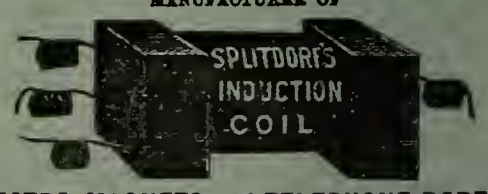
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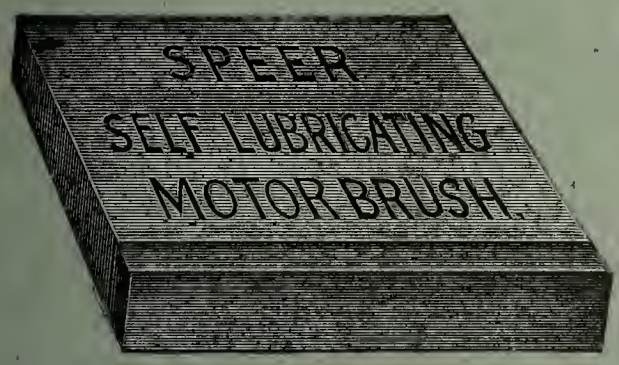
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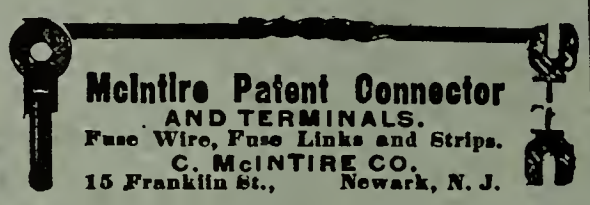
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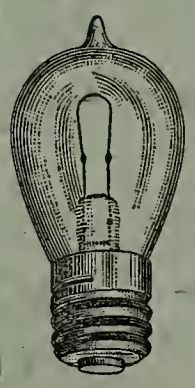
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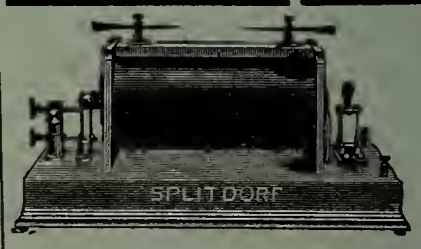
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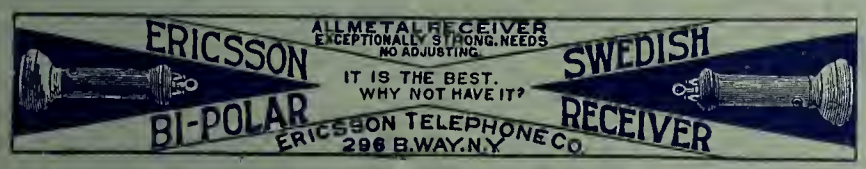


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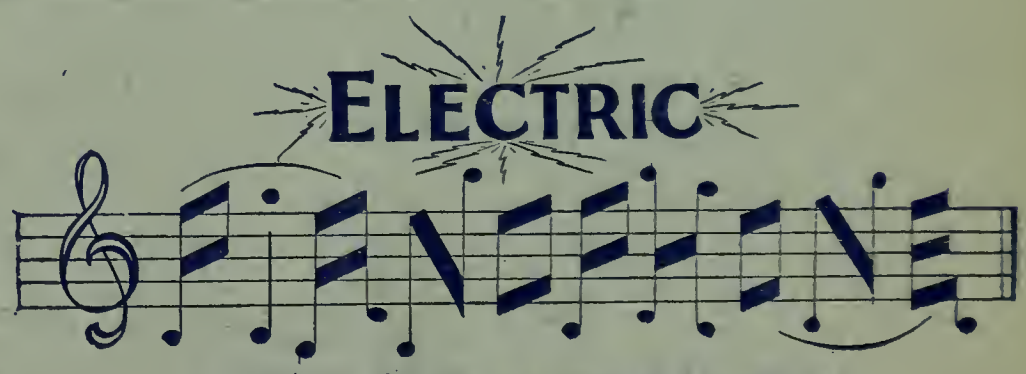
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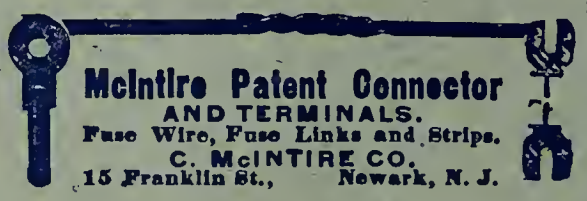
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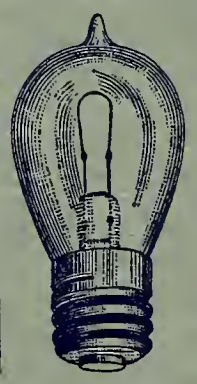
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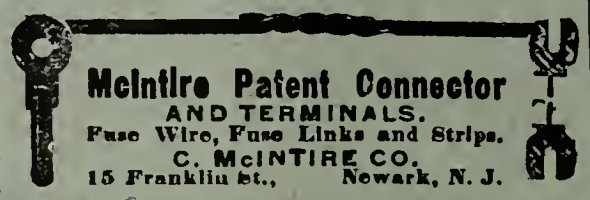
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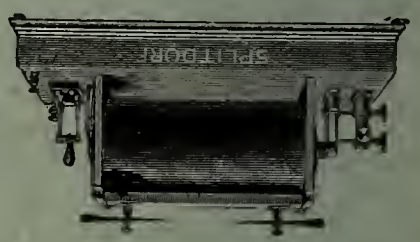
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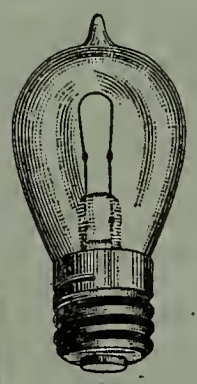
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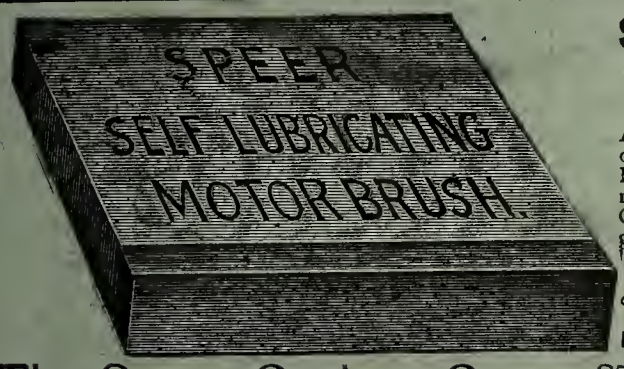
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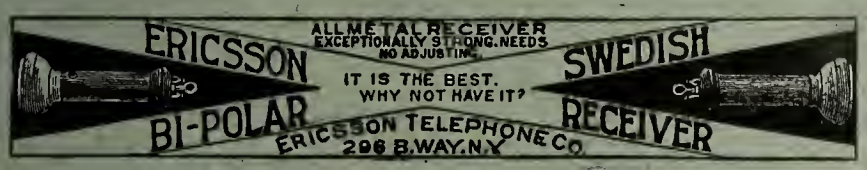
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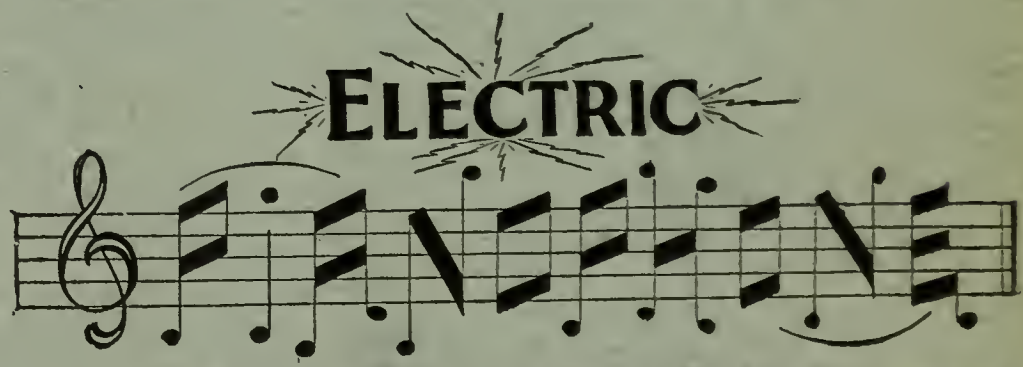


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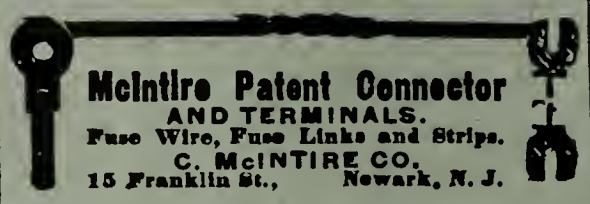
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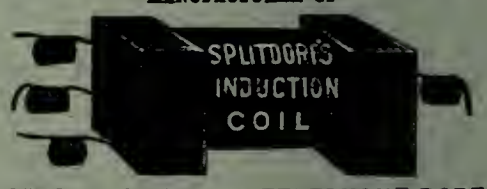
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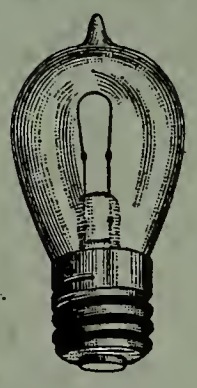
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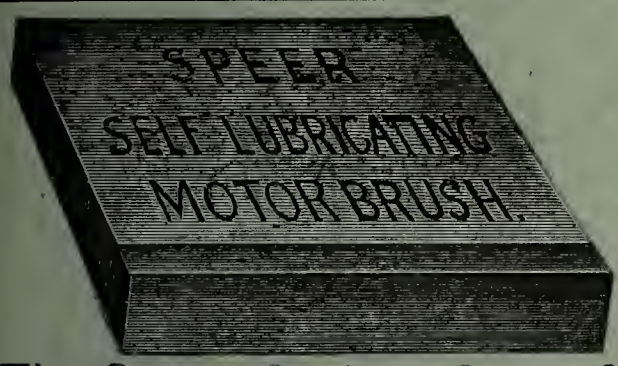
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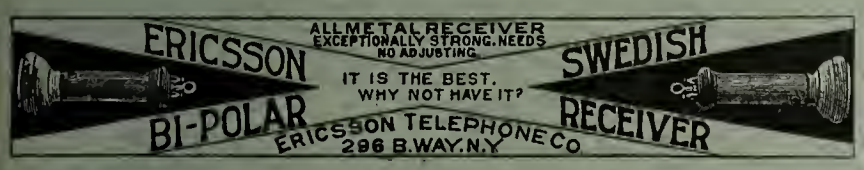
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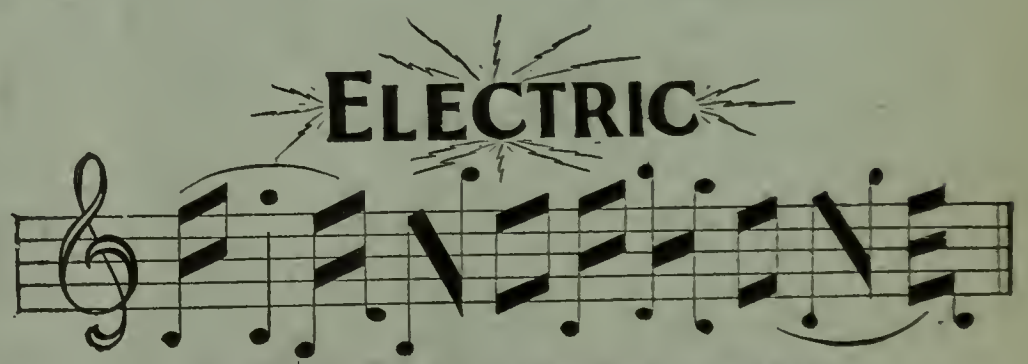


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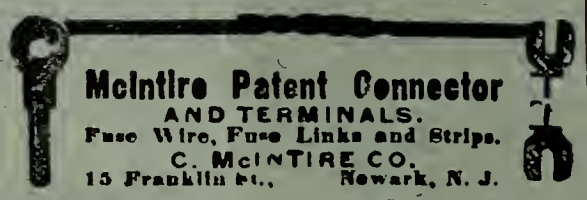
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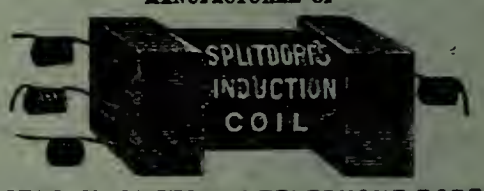
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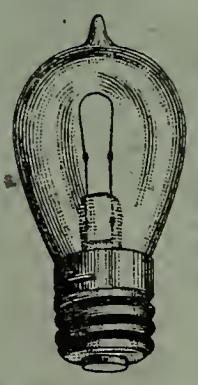
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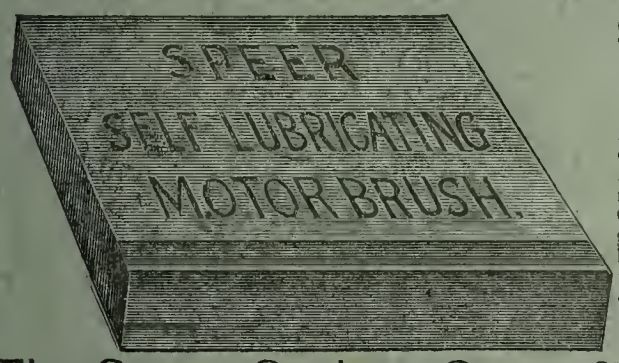
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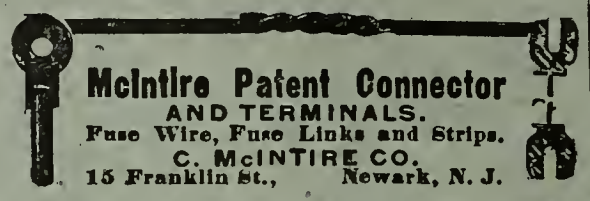
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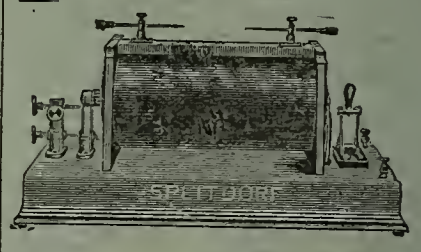
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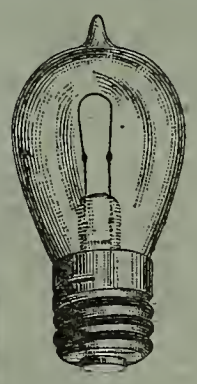
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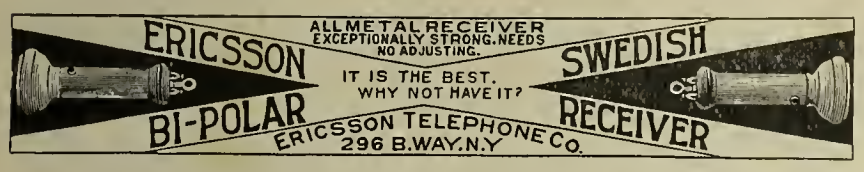
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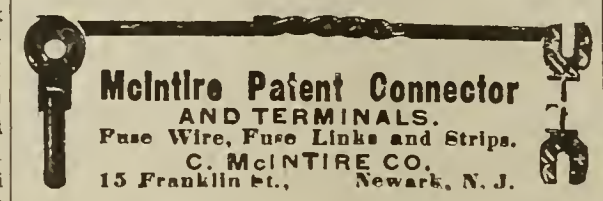
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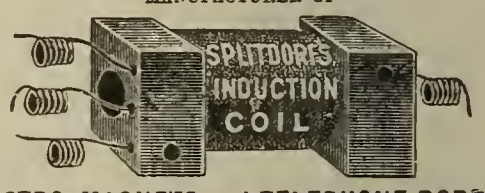
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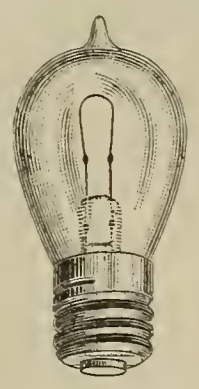
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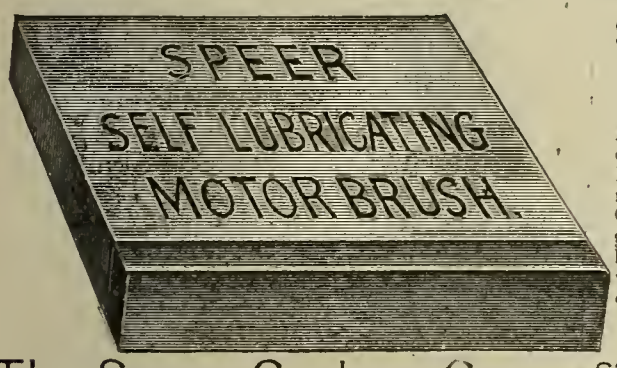
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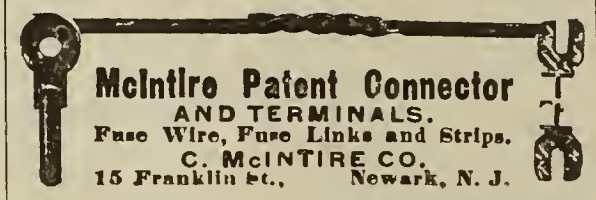
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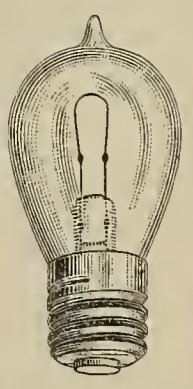
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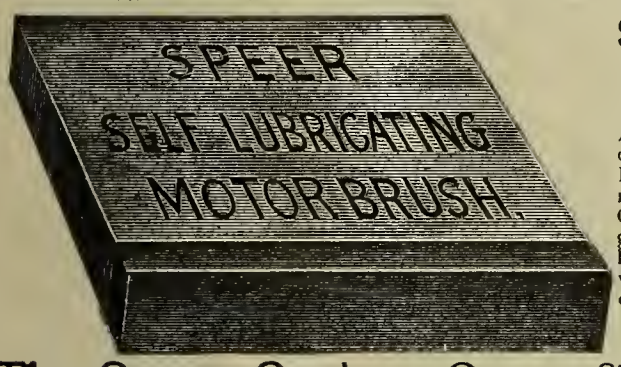
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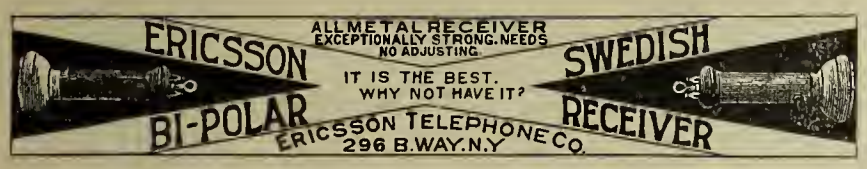
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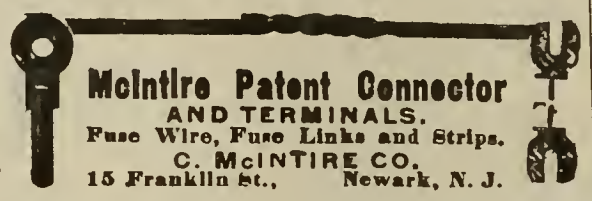
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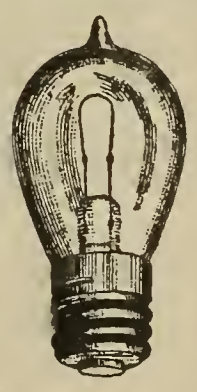
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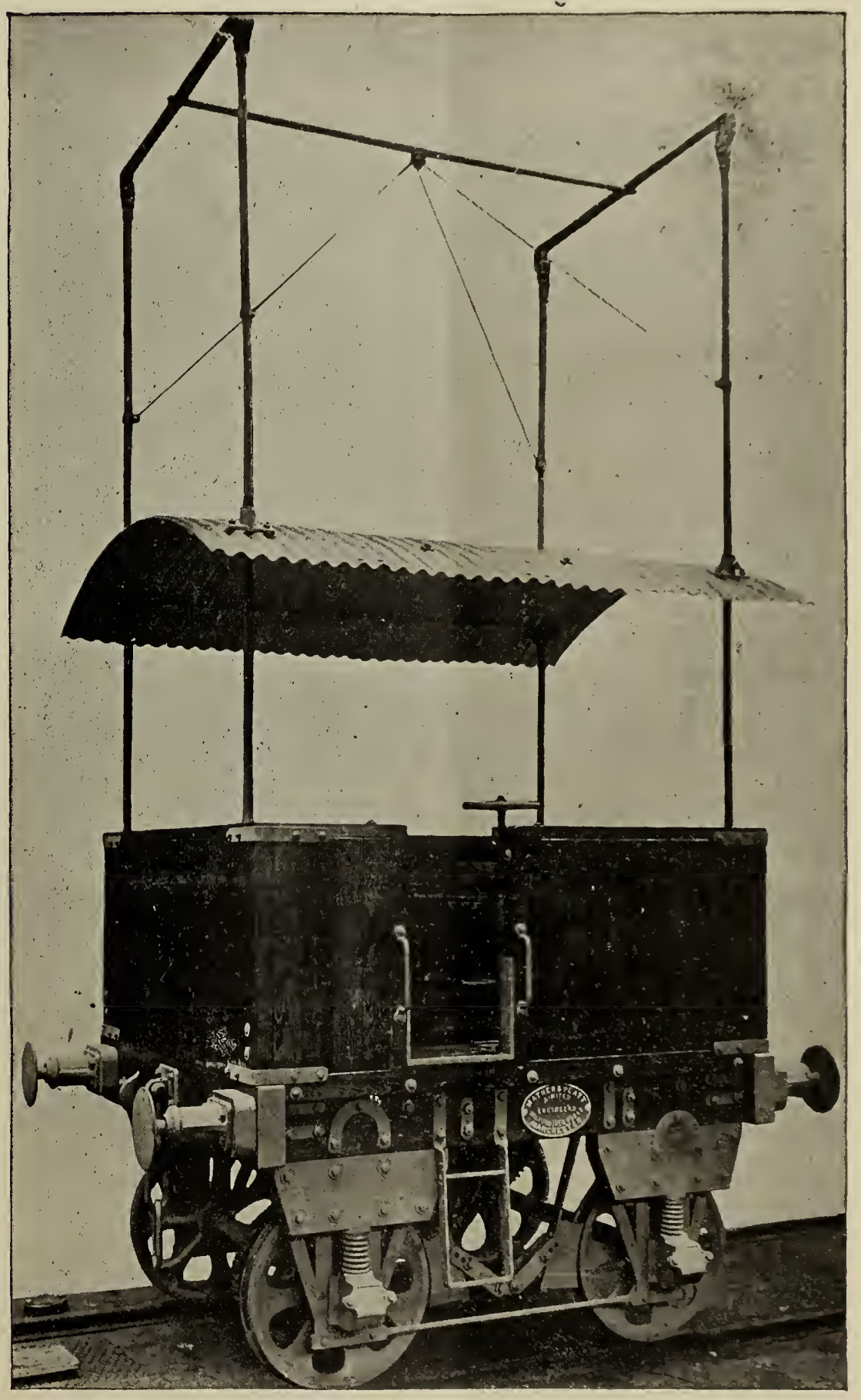


Fig. 1—Electric Shunting Locomotive Used at English Textile Plant.

ENGLISH ELECTRIC SHUNTING LOCOMOTIVES.*

BY FRANK C. PERKINS.

What is known in American railway practice as an electric locomotive for switching freight cars, and in steam railway work is termed a switch engine, is called on English railways a "shunting" locomotive.

*From "Electricity."

An electric shunting locomotive, of the type shown in Fig. 1, has recently been placed in service at the textile machinery works of Tweedales & Smalley at Castleton, and has been giving excellent satisfaction. It is used for switching cars on the siding connecting the boiler house and delivery stores of the textile machinery works with

the main line. Although the service is light, it is hardly necessary to point out that, were it required, a locomotive of much greater capacity could be provided; and wherever locomotive power is needed at private works possessing a stationary power plant, there is probably no method of obtaining motive power more conveniently and economically than by the addition of an electric generator, and the construction of an overhead trolley system. The electric generator which was installed in this plant was of the Manchester type, and designed for 100 volts and 54 amperes at 1,100 revolutions per minute, and is driven off the main shafting in the works. The current is conveyed from the generator in the usual manner to the overhead wires, and returns through the rails, which are bonded with copper strips and rivets. The locomotive shown in the illustration was constructed by Messrs. Mather & Platt, Limited, of the Salford Iron Works, and somewhat resembles the ordinary goods wagon used in the English works. The driving motor is also of the Manchester type. It is mounted on a cast-iron bed plate, which slides on cast-iron brackets bolted to the frame of the car. A vulcanized fiber pinion is used having 21 teeth and having on the ends steel end plates. This pinion gears with a cut cast-iron wheel of 72 teeth on the gudgeon shaft, on which is keyed a chain pinion of 7 teeth, driving a chain wheel of 22 teeth. The latter is split into two halves, and is fitted to one axle of the locomotive. The car has coil spring buffers, also axle boxes and guides, and a hand screw brake with brake blocks of wood bearing on the 28-inch wheels. Wrought iron pillars extend through the corrugated iron roof, and carry the collector bars. This locomotive weighs about three tons and the controlling mechanism consists of a main switch and a rheostat for starting and regulating the speed, and also a reversing switch.

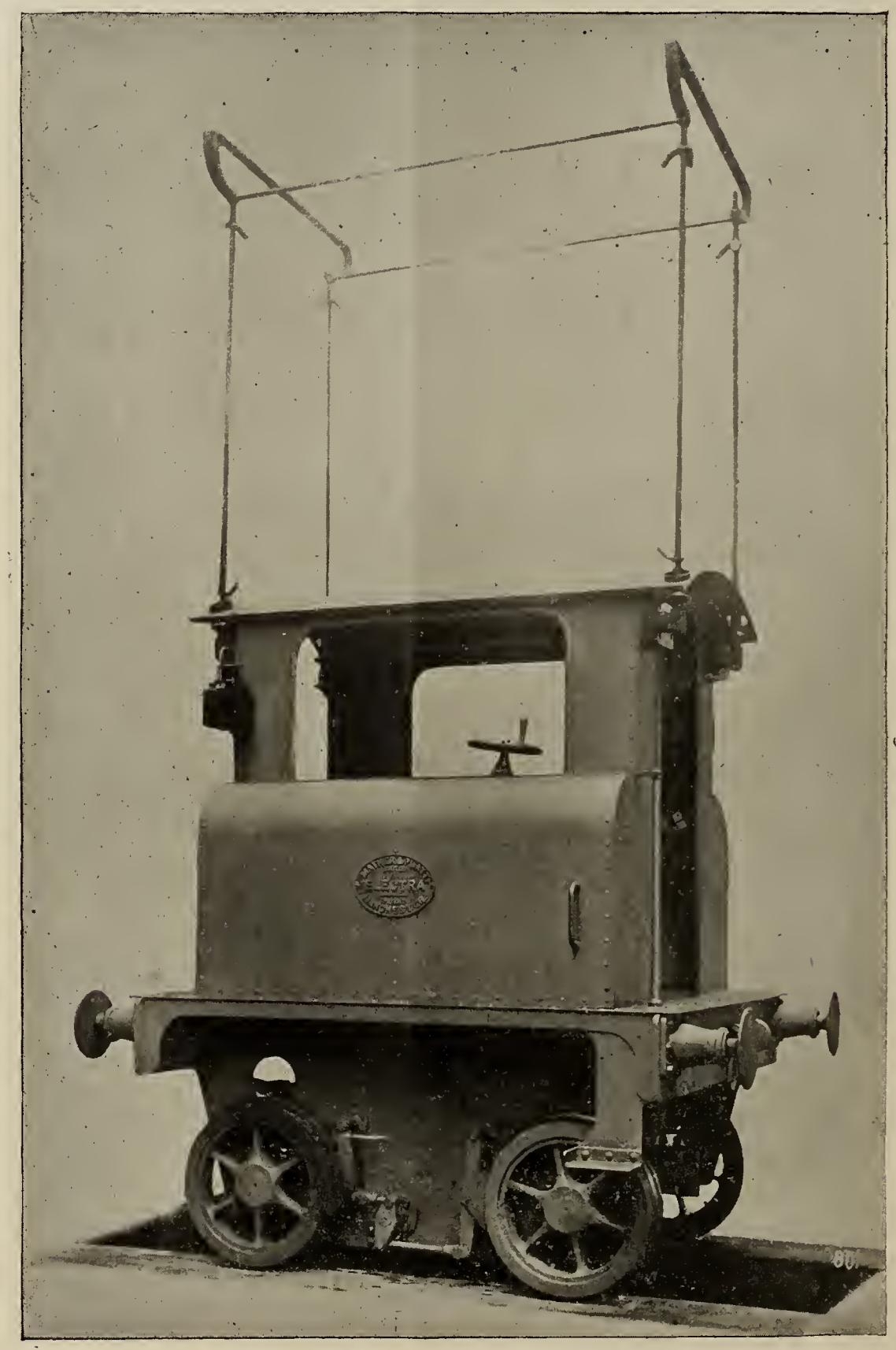


Fig. 2.--English Electric Shunting Locomotive Used at Swedish Iron Works.

The system of collecting the current on this line is

peculiar, and consists of two wrought-iron bars located about 6 feet apart, one of which is always rubbing on the under surface of the trolley wire. This system is also used on a more extended scale on the Douglass and Laxey Electric Tramway. As this locomotive is used usually only two or three hours per day it is said to effect a considerable saving over a steam locomotive, which would have to be continually kept fired up, while the generator can easily be started by throwing the power on the machine from the main shafting. The same generator is used for operating the three-ton electric crane, usually in operation, and hence the locomotive may be used at any time.

The electric shunting locomotive, shown in Fig. 2, was built by the same firm for a large iron works in Sweden, and is designed to draw a load of nearly 100 tons at a maximum speed of four and one-half miles per hour. The voltage in this line is 300 to 330 volts. The side frames of this locomotive are steel, and the wheels are 27 inches in diameter with a wheel basis of four feet 6 inches long. The design of the cab is similar to those made by the same firm for the City and South London Railway. The motor used on this locomotive is of the double armature type made under the patents of Drs. J. & E. Hopkinson. The armatures are connected to the axles by means of spur gear, ten to one. As will be noticed in the illustrations the over-head collecting gear is similar to that of the locomotive previously described, except that the height is in this case about 16 feet from the ground. All of the working parts and the controlling machanism are boxed in on account of the heavy falls of snow experienced in the winter season in Sweden.

Educational.

LEHIGH UNIVERSITY.

The following are the subjects of theses to be presented by candidates for the degree of electrical engineer at Lehigh University, South Bethlehem, Pa. June, 1900:

Berthold Graeff (with R. M. Freeman), West Bethlehem, Pa., "Design of a Six Phase Alternator;" Edwin Percy Bigelow (with A. T. Brice), Oxford, N. J., "Desigh of a Set of Transformers;" Andrew Thomas Brice (with E. P. Bigelow), New York, N. Y., "Design of a Set of Transformers;" Hugh Banks Chapman, St. Elmo, Tenn., "The Design and Construction of a Scott Two Phase Three Phase Transformer;" Gavin Hogg Dortch, Goldsboro, N. C., "Plans and Estimates for a Water Power Electric Plant;" Richard McNamee Freeman (with B. G. Beck, Andover, N. J., "Design of a Six Phase Alternator;" Frederick Augustus Groff, Rome, N. Y., "Design of a High Potential Transformer;" Michael James Honan (with T. A. Yasharian), Oxford, N. J., "Electrical Survey of the Electrical Railroad Earth Currents of the Bethlehems;" John Alvin Strauss (with W. P. White), Sayre, "Steinmetz's Theory of the Induction Motor;" William Penn White (with J. A. Strauss), Washington, D. C., "Steinmetz's Theory of the Induction Motor;" Toros Asadur Yasharian (with M. J. Honan), Hedjin, Armenia, "Electrical Survey of the Electric Railroad Earth Currents of the Bethlehems."

Electric Power.

ELECTRIC POWER FOR MONTREAL.

Announcement is made that the Shawinigan Water and Power Company will transmit the power which it has developed to Montreal. It is the intention of the company to make available at Montreal the great power which is being developed at Shawinigan Falls. The company will early in the coming summer complete the works it has had in process of construction during the past year. These works consist of a canal and the necessary flumes, etc., to develop 30,000 horsepower, and the construction is such that the amount of power can easily be increased to 75,000 horsepower. The works will be utilized during the coming summer in the delivery of power to manufacturing establishments at Shawinigan Falls; but it is not the purpose of the company to deliver the power in Montreal until the spring of 1901.

The transmission line will be a little less than 80 miles in length and will run along the Great Northern Railway, now being completed, which runs in a direct line west from Shawinigan Falls to Joliette. From this point, the transmission line will run in an air line to the end of the island of Montreal, coming into the city of Montreal by the most direct route available.

The loss in the 80-mile transmission will be reduced to a minimum by the adoption of the most improved methods of electrical transmission.

By reason of the low cost of development at Shawinigan Falls, the company will be able to deliver the power in Montreal at prices which will be advantageous to the consumer.

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Miscellaneous.

A HINT TO VISITORS AT THE PARIS EXPOSITION.

Visitors to the Paris Exposition have been warned that they must guard against injury to their timepieces when they inspect the remarkable exhibition in the Palace of Electricity. This feature of the great fair is certain to be very popular, for the practical application of electricity to everyday uses is too recent a development of science to have lost its novelty; and the exhibition includes everything needed to illustrate the progress of electrical discovery and the present uses of electricity in the arts and industries. There are large and small dynamos by the score developing the subtle curent; and there are parts of the building into which watches cannot be carried without paralyzing their internal functions. In other words, the intense magnetic force developed is all pervading and magnetizes any steel that comes within the range of its influence. Watches stop entirely or work so poorly that they are useless.

If your excellent timepiece should be overtaken by this calamity when you are visiting the Palace of Electricity, you might investigate its delicate machinery with a microscope without discovering the cause of the trouble. But if you should touch any part of the works with an ordinary piece of steel the secret would be out. The steel would adhere to the works. The steel springs, needles and wheels, it would be evident, having been turned into so many magnets, would be too overburdened by the new property to keep on recording time. It would be a case of paralysis. One of the Paris newspapers recods the affliction thus visited upon the fine chronometer of Dr. Luys, "the well known Charity physician," whose watch was put out of service within five minutes after he entered the Palace of Electricity.

There is fortunately a simple prescription that will prevent the paralysis of chronometers. Leave your watch in the safe at your hotel on the day you visit the great electrical display at the Exposition.—N. Y. Sun.

Improvements in the Incandescent Lamp.

THE FIVE HUNDRED VOLT LAMP. WILL THE CARBON FILAMENT EVER BECOME OBSOLETE?

By F. M. F. Cazin.

(Continued from page 206.)

Nevertheless it is interesting to observe the coincidence with their unauthorized publication of a declaration on the part of Mr. Thos. Edison, as follows: "An inventor has no show these days. The moment he invents something which is an epoch maker in the world of commerce or science there will be pirates to spring up on all sides to contest his rights to his ideas. These pirates can readily get millions at their back. They go to the courts and enjoin the inventor for ten, twelve or fourteen years from the use of his invention. Meanwhile, the court allows them to proceed with the use of the same device; so there is no monopoly. The inventor always gets the worst of it in the courts even though he may hold in his hand the patent from the United States Government."

Mr. Edison surely knows what he is talking about; nevertheless I venture to say that my former employees will not give me much trouble by appropriating that which I have well covered by seven patents issued and five applications pending.

I may now proceed to consider the publication first cited. Elihu Thomson, in a series on "Carbon in Electrics" finds occasion to deal a blow to the proposed use of rare metal oxides in the luminant of the vacuum lamp. The manner in which he does it is not consistent with his reputation for careful consideration before expressing an opinion; a fact which indicates a program under orders. He says:

"Attempts have also been made by many people to incorporate other substances with the carbon filament or to coat it with what are sometimes called luminescent substances, supposed to be capable of converting comparatively low temperature heat into light, or rather of giving out light at relatively low temperatures. I refer to the use of oxides of thorium, zirconium and cerium, as used in the Auer Von Welsbach mantle, or calcium oxide as used in the lime light. Personally, I could anticipate only failure in these cases on account of the inevitable disintegration of the mixed filament, and the doubt I have long had as to the cause of the luminescence in question. Experiments made a number of years ago tended to show that the light emission from mantle material was really a result of high temperature, and that the substances called luminescent have the power, like platinum sponge, of causing union of flame gases with oxygen in their pores when heated." Here again we meet with a coincidence which deserves some attention. Elihu Thomson lays stress on "mixed filaments."

When speaking of the combined use of carbon and rare metal oxids in the luminant of a vacuum lamp in an application of X. 29, 1895, I stated: "Burning out so much of the remaining substance of the fabric, as is not intended to act as accessory filament, the residue of the fabric, when in a carbonized state, may be used as a filament proper or as an accessory filament, the coating of oxides favoring the use of a tender ramified filament." (My patent No. 621,291.)

Even under date of Dec. 7, 1892, I specified as follows: "The semi-conductive material intended and adapted for being electrically heated to incandescence is not necessarily a filament surrounded by an empty space, but is such matter of any degree of cohesiveness or non-cohesiveness, such as powder, etc., in the shape of a solid line of a minute transverse section, embedded entirely and directly in a solid, non-conducting material." (Patent No. 523,460.)

Under date of March 31, 1898, Mr. Edison applied for and on June 6, 1899, obtained patent (626,460) for a claim: "An improved filament for incandescent lamps, consisting of a highly refractory non-conducting material, having isolated particles of carbon therein."

It is not proper to here divulge facts which have a pertinent bearing on the interference proceedings in which the matter will be involved; suffice it to say that the contents of my prior application were known to many since 1897, and that again in this instance there is no danger for the real inventor. Evidently other causes besides those stated by Mr. Elihu Thomson prevail for antagonizing the oxid filament. The causes stated by him may be enumerated as follows: (1) the inevitable disintegration of the mixed filament, and (2) the doubtful cause of the luminescence of the rare metal oxids.

The inevitable disintegration of a filament (mixed), where carbon and oxides are in immediate contact with one another, is the main subject of discussion and of disclosure, together with the effective preventive of such disintegration, of my application dated IX., 11, 1895, (Patent 620,640) or two and a half years prior to Mr. T. Edison's alleged invention of a filament, where such inevitable disintegration is left as an auto-destructive evil, to prevent the usefulness of that which he claims. The remedy consists in chemical insulation, such as patented by me.

(To be concluded.)

Among the Societies.

MEETING OF THE AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION.

The tenth annual meeting of the American Electro-Therapeutic Association will be of unusual interest. It will be held on September 25th, 26th and 27th, 1900, at the Academy of Medicine, in New York city. The headquarters will be one block from the Academy, at the Hotel Bristol, corner of Fifth avenue and 42d street; American plan, at the reduced price of $4 per day, "first come, first served." Rooms will be reserved by direct communication to the proprietor, or ordered by the committee of arrangement. The chairman of the committee of arangement is Robert Newman, M. D., 148 West 73d street, New York city. The committee has made arrangements for the meeting for scientific and social pleasures, so that the members will be in continuous attendance from early in the morning until midnight, varying social pleasures with scientific matters. Many surprices are in contemplation and some have been positively arranged, as visits to the greatest electric enterprises in the world. All success is positively secured and assured. At this early date so many scientific papers have been announced that the members are earnestly requested to send in the titles of their intended papers at once to the chairman of the committee of arrangement, or to the secretary, as from present indications there will be more papers offered than the time will allow to be heard, and the earlier announcements must necessarily have the preference. The attention of the members is also directed to the two discussions on the programme:

1. Electricity in gynecology and the present reluctance of gynecologist to use electricity.

2. Electricity in tuberculoscis and the present modes of treatment.

Members who wish to participate in these discussions will please communicate with the president as early as possible.

Ladies are expected to be present in large numbers, and will be entertained in sight seeing by an extra ladies' committee, for which four routes are particularly pre-

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LIGHTNING AND EXPLOSIVE EFFECTS.

During this period of civilization, when all things pertaining to the abnormal are referred to science, a clearer insight into the cause and effects of lightning relieves it of that atmosphere of mystery through which for countless ages superstition, with respect to that remarkable phenomenon, has thrived. Electric discharges of such magnitude that they can be included under the head of such phenomena as lightning are presumed to be due to the electrification of aqueous particles brought about by the natural process of evaporation. The layers of clouds visible during a thunderstorm represent to the scientific eye cases lying within the scope of the textbook treating of static electricity. The original charges are contained in great masses of vapor which exercise an inductive effect upon those vaporous masses situated above or below the original charge. The meteorological influence at work, through which the clouds during or prior to a thunderstorm accumulate and concentrate, relate to a department of science of a purely physical character. When the masses of vapor have combined to such an extent that the aggregation of charges become in total heavy enough to cause a disruptive discharge through the proximity of an oppositely charged body, which may have been brought into that condition purely by induction, then the phenomenon of lightning takes place and many of the effects of explosions, globular discharges, etc., appear. The most interesting, in many respects, and for a time the most mysterious of these effects was the disruption of trees, flagpoles and other objects of a similar character. An explanation of this has been given which is reasonable and natural. The periments with tubes filled with water and tightly sealed. By passing through a device of this kind a disruptive dispassing through a device of this kind a disruptive discharge the tube was shattered and the same effect produced as though it were struck by lightning. Investigations proved that in some tubes experimented with which were but partly filled with water disruptive effects were not in evidence. On the other hand, when the tube was absolutely filled with water and then sealed the explosion was instantaneous. As a result of various and varied experiments it was shown that the explosive action was entirely due to the production of gases and vapor within the tube. In the case of woody fibre, saturated with moisture, each little cell of which constitutes a tube more or less filled with water, the same action takes place when a static discharge passes through the tree, trunk or pole. In other words the splitting of a flagpole or the rupture of a material of a similar nature is presumably due to the generation of gas within the cells, which tears the tissues apart in the manner familiar to many residing in city or country.

The dimensions of a flash of lightning vary in many respects. It may be a short thick discharge or a long ragged one. The amount of energy dissipated by a lightning discharge has been calculated and shown to vary from one thousand to ten thousand horse power. According to Mr. George Rumker, of the Hamburg Observatory, who secured a photograph of a lightning discharge as it struck a tower within a third of a mile from where he was standing, the flash was one-fifth of an inch wide and of a length estimated to be between two and four thousand feet. Among the builders of static machines a millimetre is generally allowed for each thousand volts pressure. The reader will gain a rough idea of the potential developed at the instant of discharge in the case referred to above. A curious phenomenon was visible during a recent electrical storm in New York in the vicinity of Brooklyn Bridge, which is mainly composed of steel. It illustrated the influence of induction to a marked degree and proved that lightning does not always descend from above but may ascend from below. In other words, it represented a case of a brilliant discharge emanating from the Bridge itself, due to the fact that an opposite charge had been induced in it by the overhanging cloud. This is just as apt to happen as for the lightning to flash from the cloud first. In fact, the original starting point of a discharge is difficult to determine. Whenever a static discharge takes place there is generally an unusual degree of oscillation. It has been calculated that in the case of a Leyden jar these oscillations may reach many millions a second. The starting point is therefore more or less indefinite but at times lurid manifestations are in evidence as in the case cited above.

pared, including museums, libraries, churches, drives, Central Park, Aquarium, Stock Exchange, etc.

In contemplation are visits to electric laboratories, the mysteries of the telephone central with all the latest appliances, the headquarters of the Automobile Company, the largest electric powerhouse in the world, Grant's Tomb, hospitals, etc., to some of which invitations have already been received.

The officers of the association are as follows: Dr. Walter H. White, president; Dr. D. Percy Hickling, first vice-president; Dr. Charles O. Files, second vice-president; Dr. George E. Bill, secretary; Dr. R. J. Nunn, treasurer.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.

PATENTS ISSUED JUNE 26, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

652,266. Electro-Magnetic Brake. Edwin M. Herr, Pittsburg, Pa.

652,272. Telephone Toll System. John A. Johnson, Waveland, Ind.

652,360. Motor-Rheostat. John S. Hall, Schenectady, N. Y.

652,385. Secondary Battery. Clyde J. Coleman, Chicago, Ill.

652,432. Telephone System. Cornelius C. Gould, Philadelphia, Pa.

652,436 and 652,437. Thermo-Electric Battery. Joseph Matthias, Stuttgart, Ger.

652,438. Electric R. R. System. Lowell M. Maxham, Boston, Mass.

652,453 and 652,454. Alternating-Current Electric Meter. Emile Batault, Geneva, Switzerland.

652,459. Electric Circuit. C. C. Gould, Philadelphia, Pa.

652,494. Electric-Lighting Apparatus. Chas. A. Terry, N. Y.

652,508. Microphone-Transmitter. C. B. and C. E. Clark, Sing Sing, N. Y.

652,580. Electric Lamp. Serge B. Apostoloje, London, Eng.

652,595. Telephone Transmitter. Frederick G. Creed, Glasgow, Scotland.

652,596, 652,597, 652,598, 652,599, 652,600 and 652,601. Electric Switch. Ethan J. Dodds, Avalon, Pa.

652,607, 652,608, 652,609 and 652,610. Electric-Lighting Apparatus. Marshall W. Hawks, Pittsburg, Pa.

652,699, 652,700, 652,701, 652,702, 652,703, 652,704, 652,705, 652,706 and 652,707. Electric Lamps. Alexander J. Wurts, Pittsburg, Pa.

A BILL FOR THE REGISTRATION OF ELECTRICIANS.

The bill for the registration of electricians, introduced in the New York Legislature by Dr. Henry, is meeting with great opposition, and active measures have been taken to prevent its passage.

Dr. Henry said when he introduced the bill that it was intended primarily to prevent incompetent workmen from putting in electric wires in buildings as bungling workmanship was the cause of frequent fires. The provisions of the bill, however, are such as to cause considerable opposition from electricians.

The bill defines an electrician as any person engaged in installing plants for furnishing electric current in buildings, or placing, altering or repairing electric wires, apparatus or appliances therein for light, power or heat.

It provides that the Governor shall appoint in each county having a population of 100,000 or more, and in which there is a city, a County Examining Board of three for the examination of electricians.

Two of the board shall be master electricians of not less than seven years' experience in installing electric apparatus and the third an electrical engineer.

In the counties included within New York City the Commissioner of Public Buildings, Lighting and Supplies shall be a member of the boards ex-officio without compensation. The members of the boards are to be appointed for one, two and three years.

The boards shall examine all applicants and grant them a certificate upon their being duly qualified. The board is given power to issue a certificate to any person without examination upon the presentation of an affidavit that he has been engaged in the business for five years immediately preceding. For each certificate issued the board is to charge a fee of $25.

The County Clerk of each county shall keep a register of the names of those to whom certificates have been issued. For this the electricians must pay one dollar each. A fee of two dollars must be paid for each renewal.

Corporations are allowed to engage in the business, provided their president, vice president, secretary, treasurer or general managing agent is registered. Workmen under the direction and control of an electrician holding a certificate need not be registered, and the act does not apply to plants, wires or other apparatus for telegraph, telephone or signalling purposes.

A SUMMER HINT.

When everything seems dull and slow
And buyers fail to patronize,
Unroll your "wad" without a fear
And start to advertise.

Electric Lighting.

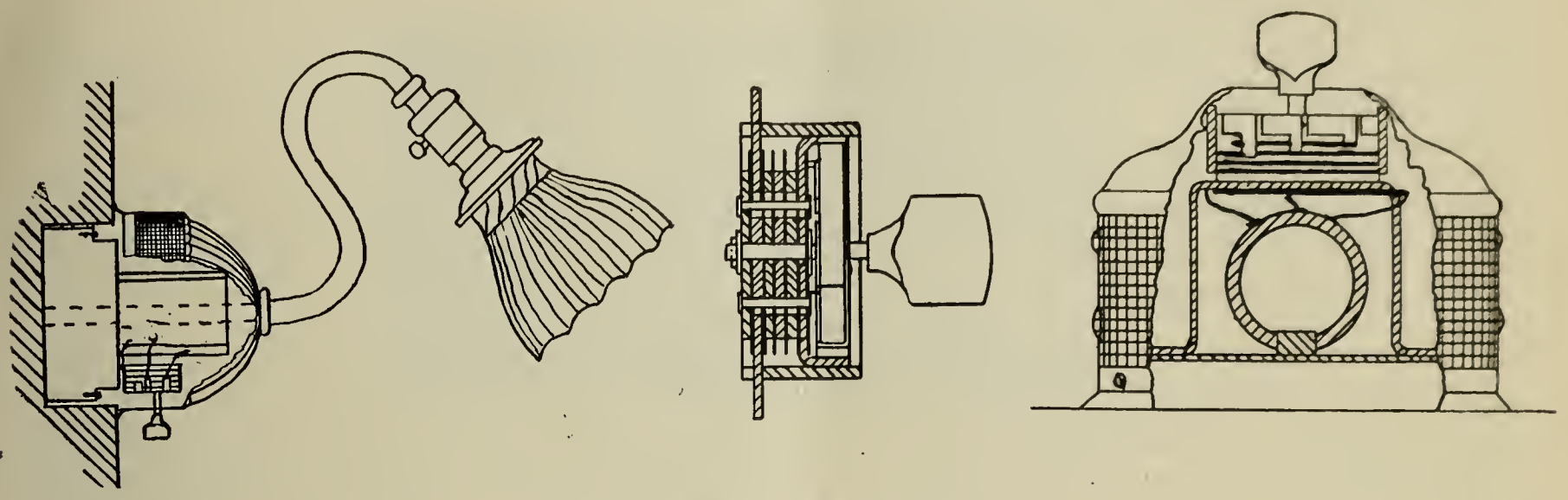
INCANDESCENT LAMP REGULATOR.

The incandescent lamp is now depended upon as a source of illumination by thousands of private individuals. It has become installed as essential to happiness and comfort, but has all along possessed a glaring defect which in the minds of many is almost an objection to its use. Whereas gas light and oil lamps can be regulated the incandescent lamp has hitherto been sold as it is supposed to be used, merely sixteen candle power, without any variations of any description possible. It is impossible for many people to sleep with a bright light in the room and in a great many other cases, such as in the staterooms of ships, in bath rooms, cellars, etc., power to regulate the light is almost as important as the light itself.

In the various illustrations are shown an apparatus by the aid of which the candle power of the light can be governed in a manner highly satisfactory to the purchaser and the Board of Inspection. The Electric Regulator Company, of 26 Cortlandt street New York city, manufacture and sell the attachment, by means of which the incandescent lamp possesses all the light gradations capable in a gas jet. In figure 1 the bracket is shown in position, the canopy covering the regulating mechanism, the hand being applied to the key in the same manner as

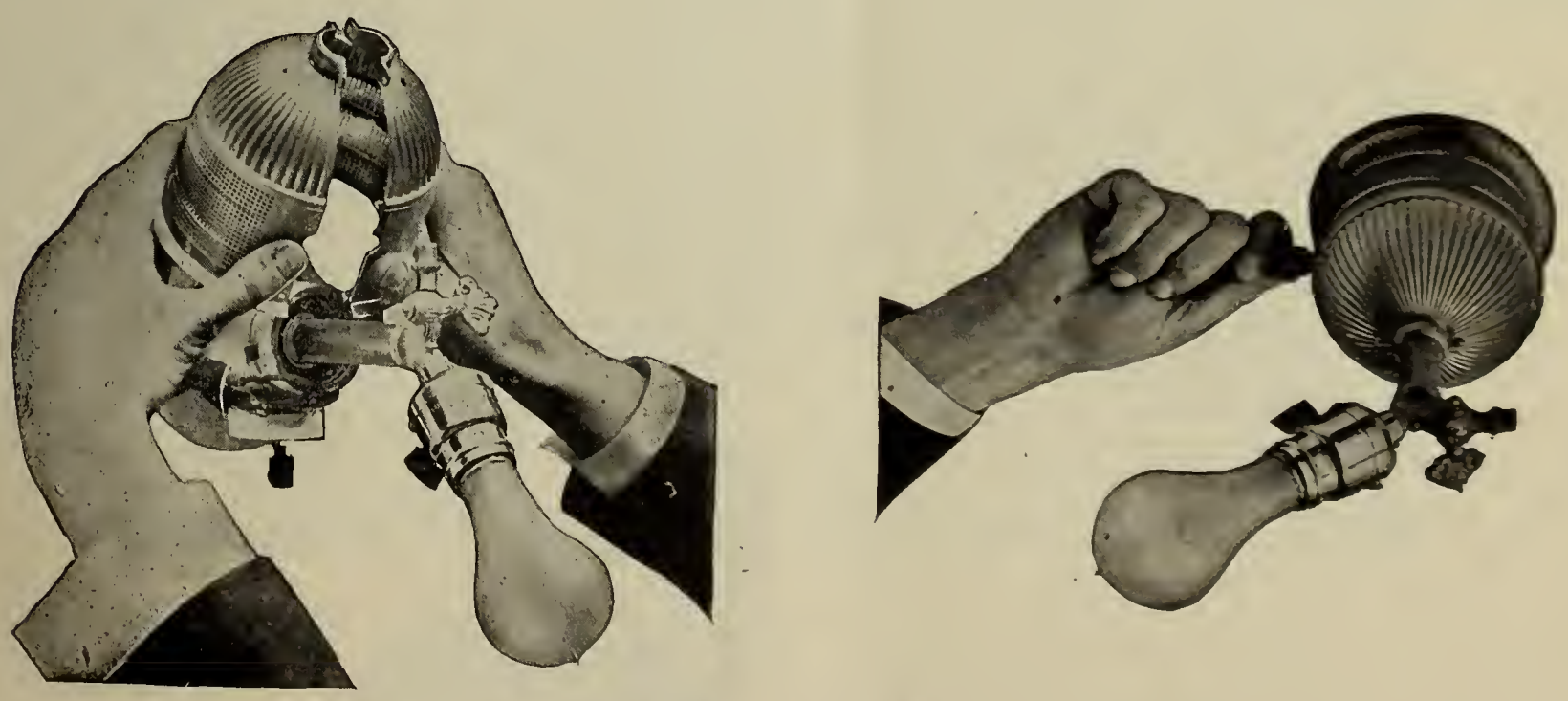
to a gas jet. The key of the lamp socket is kept fully on, all regulation being accomplished by the key to which the hand is attached, as shown in the illustration.

In figure 2 the canopy is shown open, with the internal mechanism somewhat exposed. The resistance is a hollow cylinder of enamelled iron with the resistance wires insulated from the iron shell by enamel and at the same time held in place by it. The various contact points of this resistance are arranged in a compact and convenient manner so that by turning the key a short metal arm switches in and out the various sections of the resistance. The resistance cylinder and the switch are mounted on a base to which legs are attached for the purpose of securing it to the wall when required. The apparatus is capable of four variations with one turn of the key; the first being very bright and the last little more than a gleam of light. The switch is unique in construction and is built up of metal and mica in layers. Contacts from the metal plates are thrown into circuit with the spring on the key shaft, which, when revolved, throws the various sections of the resistance in and out.



FIGS. 2, 3 AND 4.—ELECTRIC LIGHT REGULATOR.

The fact that this device is absolutely fireproof is of more importance commercially than the mere invention of it. From a practical standpoint this is the first regulating switch of any commercial consequence that was ever placed on the market and is therefore entitled to all the credit and success it is bound to meet with. The above device is manufactured by the Electric Regulator Company, 26 Cortlandt street.



Incandescent Lamp Regulator.

Business News.

NEW INCORPORATIONS.

Waterloo, Iowa.—The Waterloo Electric Light and Power Company has been chartered; capital stock, $1,000; directors: Hezekiah K. Leas, James P. McCague, Michael Kiplinger, Alfred Kelly and Frank Boughton.

Canandaigua, N. Y.—The Ontario Light and Traction Company, of Canandaigua, has been incorporated to operate an electric plant and street railway; capital, $100,000; directors: J. Howard Burgess, Elmira; J. H. Pondee, and H. B. Ferguson, Canadaigua.

Sullivan, Ind.—The Sullivan Heat, Light and Power Company has been incorporated; capital stock, $25,000: William H. Crowder, Lafayette A. Stewart, Claude H. Crowder, Paul L. Reid, Edgar S. Crowder, Jess W. Mahley and Henry Rost, incorporators.

Islip, N. Y.—The Sayville Electric Company, of Islip, Suffolk County, has been incorporated to manufacture and use electricity; capital, $15,000; directors: Daniel D. White, J. H. Green, Jr., Francis Gerber, Joseph A. Nauert, Sewell Thornhill, of Sayville.

Newark, N. J.—The Central Electric Company, of Newark, has been chartered to furnish electric light, heat and power. Capital, $100,000; incorporators: P.

H. Jackson, D. Farrand, V. H. McCarter, A. Riker, L. D. H. Gilmour, all of Newark; L. D. H. Gilmour, attorney, Newark.

San Francisco, Cal.—The Bay Counties Power Company has been incorporated by Eugene J. de Sabla, Jr., C. A. Grow, R. M. Hotaling, John Martin, William M. Pierson, Oscar Sutro and A. W. Linforth with a capital stock of $5,000,000, of which $70,000 was subscribed.

Carteret, N. J.—The Garrett Electric Light and Power Company, of Carteret, has been chartered to operate an electric light plant; capital, $20,000; incorporators: J. A. Quinn, of Carteret; W. K. Whitaker, of Sewaren; W. J. Lansley, of Elizabeth; W. J. Lansley, attorney, Woodbridge.

Portland, M.—The Sagadabock Light and Power Company, of Portland, has been formed to supply gas, electricity, etc.; capital, $200,000; incorporators: G. F. West, A. S. Bosworth, H. W. Ricker, all of Portland; S. C. Manley, J. H. Manley, of Augusta; Symonds, Snow & Cook, attorneys, Portland.

Portland, Me.—The Van Electric Manufacturing Company, of Portland, has been chartered to manufacture electrical machinery, etc.; capital, $600,000; incorporators: S. F. Van Choate, of Boston; W. E. Sanford, of Attleboro; C. Poole, of Rockland; J. E. Lewis, of Everett; F. A. Turner, of Foxboro, Mass.; F. Hale, attorney, Portland.

Jersey City, N. J.—The United States Battery Company, of Jersey City, has been incorporated to supply electric motor power. Capital, $500,000; incorporators: A. W. Stringham, F. Miller, both of Brooklyn; P. A. Holm, of Hoboken; A. C. Fern, O. T. Bugg, both of New York; L. H. Andrew, attorney, New York.

Norfolk, Va.—Judge Hanckel has granted a charter to the Gas and Electric Company, of Norfolk. The officers are: A. H. Rutherford, of Baltimore, president; F. R. Pemberton, of New York, vice-president; C. H. Nolting, of Richmond, ecretary; C. B. Holladay, of Richmond, treasurer. These, with J. A. Cooke, of Richmond, compose the board of directors.

TELEPHONE CALLS.

Princeton, Mo.—The Lineville Telephone Company, of Princeton, has filed a statement showing an increase of its capital stock from $2,000 to $30,000.

Charleston, W. Va.—The Petroleum Telephone Company has been incorporated to do a general telephone and telegraph business; capital, $1,000,000; incorporators: J. H. High, C. G. High, G. O. Shilton, J. E. Noyes, F. L. McGee, all of Charleston; J. W. Malcolm, attorney, Charleston.

Providence, R. I.—The Clark Automatic Telephone Switchboard Company has been chartered for manufacturing and selling automatic switchboards; capital, $1,000,000; incorporators: E. M. Prindle, J. W. Phillips, F. W. Reed, S. W. Tabor, F. A. Seib, all of Providence, R. I.; Tillinghast & Tillinghast, attorneys, Providence, R. I.

Greenwood, N. Y.—The Greenwood & Canisteo Telephone Company, of Steuben County, has been chartered to connect by wire Greenwood and Canisteo and surrounding territory within a radius of 150 miles; capital, $3,000; directors: A. P. Woodward, N. E. Coston, J. M. Atkins, J. S. Tobias, Greenwood; Frank Failing, Rexville.

Youngstown, Ohio.—The Peoples' Telephone Company, of Birmingham, Ala., capital $200,000, has been organized largely by local capitalists, who will erect an independent exchange at Birmingham and construct lines throughout the State. H. H. Stambaugh, of Youngstown, is president, and S. B. Claypool, of Birmingham, secretary and general manager.

STREET RAILWAY NEWS.

Oklahoma City, Okla.—Articles of incorporation for the Oklahoma City Land and Electric Railway Company have been filed with the territorial secretary. The company has a capital stock of $200,000 and will construct an electric street railway in Oklahoma City. The directors are: G. C. Kelley, Birmingham, Ala.; J. M. Lindsay, Gainesville, Texas; J. W. Phillips, Ardmore; S. E. Laird, G. B. Stone and J. H. Everest, all of Oklahoma City.

WELL-KNOWN NEW YORK ELECTRICAL HOUSES AT THE DETROIT CONVENTION OF THE RAILWAY TELEGRAPHERS' ASSOCIATION.

THE ERICSSON TELEPHONE COMPANY, of 296 Broadway, had a fine display of telephones and appliances, in charge of Messrs. J. F. Hemenway and J. H. Montague. Their exhibit included a complete working exchange with a large number of instruments connected to a switchboard, clearly illustrating the operation.

THE BUNNELL TELEGRAPHIC & ELECTRICAL COMPANY, 110-116 Beekman street, showed a complete line of their telegraph supplies, in charge of Mr. D. C. Bunnell, who distributed handsome leather cardcases among the delegates. This house is the sole manufacturer of the instruments patented by the late Jesse H. Bunnell, the famous telegrapher.

J. H. BUNNELL & COMPANY, 20 Park place, represented by the president of the company, Mr. Charles McLaughlin, and Mr. J. J. Ghegan, endeared themselves to all the attendents at the convention by the souvenirs which they distributed, consisting of handsome watches bearing the imprint of the house and the symbol "73" on the dial, Russia leather cardcases and change purses for the ladies. They exhibited a complete line of their specialties of interest to the telegraphers, including their new main line sounding relay, pony and pocket relays, Jones type of Wheatstone bridge, vestpocket wire calculators, etc.

A general meeting has been called by the directors of the General Electric Company for July 17, at Schenectady, N. Y., to authorize an increase in the capital stock by $4,415,000. They propose retiring all of the $5,298,000 outstanding debenture bonds with the proceeds of the above increase. The present outstanding stock consists of $2,551,200 preferred and $18,276,000 common.



WESTON STANDARD

PORTABLE DIRECT READING

VOLTMETERS

AND

WATTMETERS

For Alternating and Direct Current Circuits.

The only standard portable instrument of the type deserving this name.

Write for our Catalogue of Portable Instruments.

WESTON ELECTRICAL INSTRUMENT CO.,

114-120 William Street, Newark, N. J.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.

LONDON. Elliott Brothers, No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 2. NEW YORK, JULY 14, 1900 Whole No. 687

Telephony.

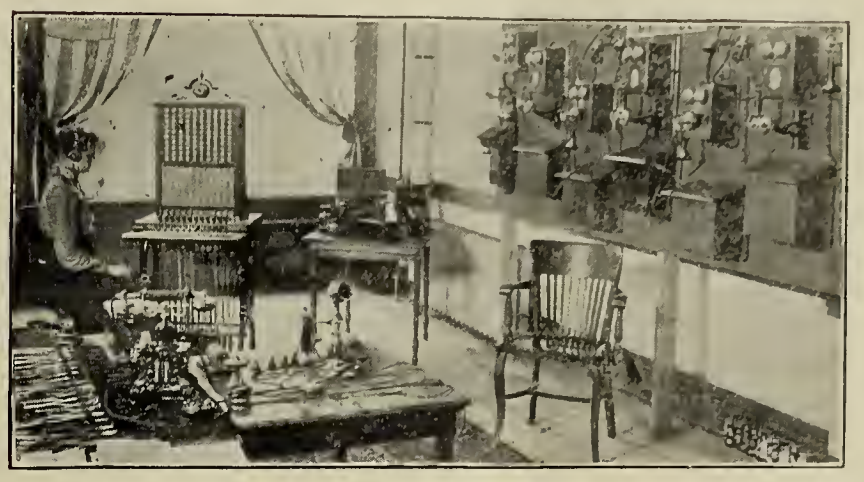


Exhibit of the Ericsson Telephone Company at the Cleveland Convention of the Independent Telephone Association.



Multiple Switchboard in the Copenhagen, Denmark, Exchange. Capacity 10,000 Subscribers. Installed by L. M. Ericsson & Co., Stockholm, Sweden.

THE ERICSSON TELEPHONE.

The establishment of telephone systems abroad is not limited to the mere installation of local lines and exchanges of but few subscribers but embraces vast territory and, in fact, represents, particularly in the case referred to, one of the most complete telephone systems in the world.

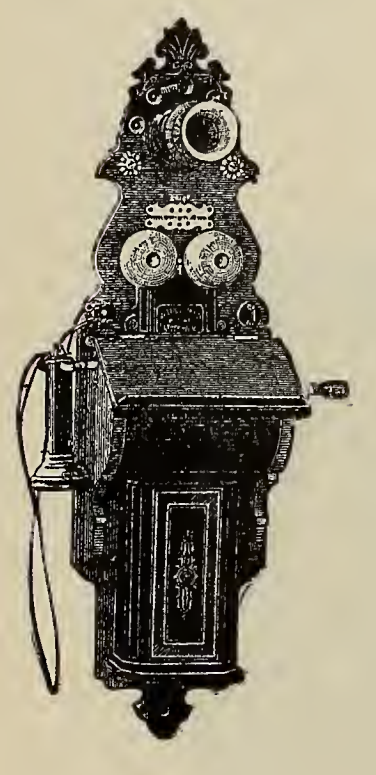
In the above illustration is shown the multiple switchboard in the Copenhagen, Denmark, exchange, with a capacity of ten thousand subscribers, the same installed by L. M. Ericsson & Company, of Stockholm, Sweden, and is the largest single switchboard room in the world. The two sides are connected together in multiple. It may be mentioned that the largest telephone switchboard in the United States is made for four thousand subscribers. This Ericsson exchange has five thousand.

Many features of the Ericsson telephone will bear careful investigation and are of the most unique character. For instance, the Ericsson coal-grain microphone is the only waterproof transmitter made and their balanced talking circuit has met with great success in this country.

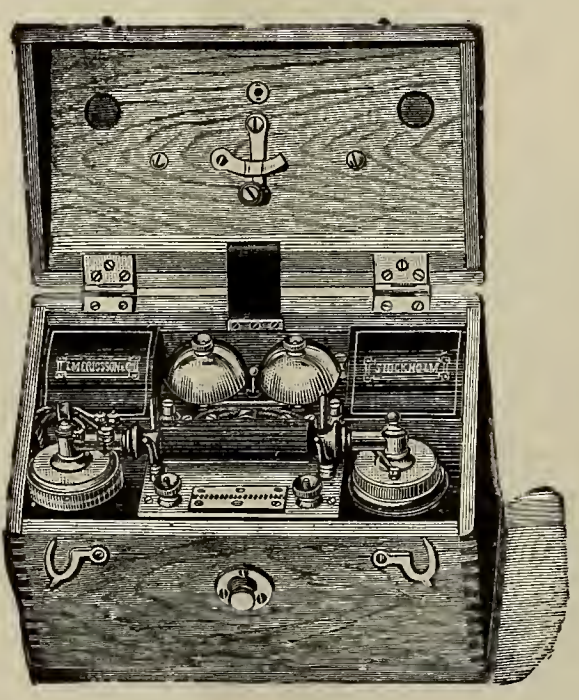
Referring again to the Copenhagen exchange, the European idea of beautifying the scene of labor as far as possible is faithfully carried out. The light streams down through a glass ceiling, arched in construction, and falls upon works of art in the nature of fine paintings and artistic marble busts. The air is kept circulating through the medium of electric fans and the comfort of each operator is carefully considered. There is a balcony in the room from which visitors can view the nature of the operations carried on.

in the past years are 8,000, of which is a new switchboard of 7,400 capacity for public call-stations exclusively. In the mainland of Denmark all the telephone companies have amalgamated into one large concern, which, within a few years, in the large centres, has put in complete exchanges with the L. M. Ericsson & Co.'s "standard" type multiple board.

In other illustrations are shown the Ericsson Swedish long distance exchange set, finished in walnut or oak. It is interesting in being the smallest generator call instrument with double battery box attached in the world. Also the Ericsson Swedish portable testing set which finds great use in military service. It is provided with combination set, two dry cells, generator, bell, lightning protector and terminals for lines and earth. Where the scene of operations is frequently shifted this testing set

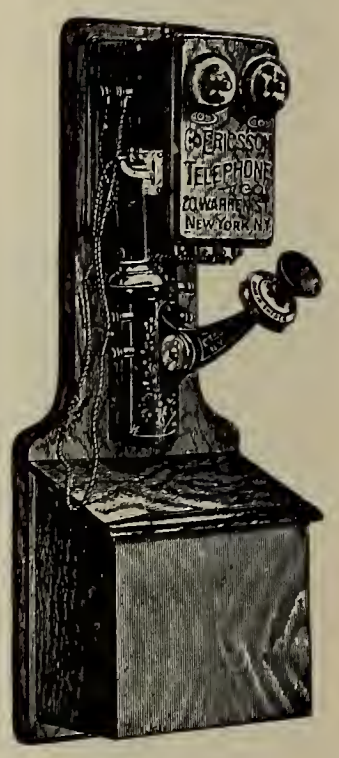


Swedish
Long Distance
Set.



ERICSSON PRODUCTS.

Swedish Portable Testing Set.
Complete with Battery Enclosed.



Wall Telephone
With Adjustable Arm.

Each subscriber has his own drop, key and cord, so the answering is done simply by pressing down the key, and the wanted connection is given by the cord, which makes the service extremely rapid. The called subscriber's drop is automatically cut out during the conversation by a relay. The multiple jacks are made very small, eight inches in length, in order not to have the operator reach too far. When the top hall is filled up, another exchange of the same size and capacity will be installed on the next floor. The cross connection board is made large enough to take 12,000 subscribers, and the cables from the outside are partly brought from the permanent derrick (or tower) and partly from the underground cables, all passing through carbon lightning arresters, and as at present Copenhagen has no trolley lines, it is, consequently, not yet necessary to have any fusible coil arrangement. Additions made in Copenhagen with-

is indispensable. The wall telephone with adjustable arm is likewise shown and can be used for speech over thousands of miles of line with absolute clearness of tone. This outfit is finished in oak or walnut and is fitted with the Ericsson Swedish coal-grain microphone and double pole receiver. The detailed perfection of the Ericsson apparatus has made it the standard of the world.

The Ericsson Telephone Company, of 296 Broadway, New York city, are issuing a series of pamphlets called the "Ericsson Series" which are supplied gratis on request. These pamphlets are full of interesting sketches and information; in fact, are of great importance to those interested in the progress of telephony. A view of the Ericsson Company's exhibit at the last convention of the Independent Telephone Association of the United States of America, held at Cleveland, Ohio, during June of this year, is also shown.

Improvements in the Incandescent Lamp.

THE FIVE HUNDRED VOLT LAMP. WILL THE CARBON FILAMENT EVER BECOME OBSOLETE?

By F. M. F. Cazin.

(Concluded from page 4.)

The second cause for antagonizing the use of rare metal oxids in the luminant of the vacuum lamp (the writer's invention) as cited by Elihu Thomson, is by him justified as follows: "Experiments made a number of years ago (my own experimental work on this line dates back, as my patents show, to surely 1892, and to the time of the cited conversation), tended to show that the light emmission from mantle-material was really a result of high temperature." This fact needed no ascertaining at all because it is a matter of general and generally accepted science. But quite different conditions prevail as to the assertion on the part of Mr. Elihu Thomson which then follows, namely: "And that the substances called luminescent have the power, like platinum sponge, of causing union of flame—gases with oxygen in their pores." The added "when heated" is out of place, because the platinum-sponge does the business without being heated, and would not do more than a common match does, or than the Nernst lamp does, the sponge being ahead of the oxids, the match and the Nernst lamp, in needing no extra heat but that produced in itself for starting ingnition or illumination. Were the assertion true that Mr. Elihu Thomson's experiments had proven that the rare metal oxids caused ignition of gases, what a boon would this be to the Welsbach-mantle manufacturers; worth millions to them! Auto-ignition by the very mantle of the gas, when it is turned on, would multiply their life-time, their usefulness and their value. It was in this connection that I tried the platinum-sponge in combination with the mantle, but neither the mantle nor the platinum-sponge would ignite the gas, such as I had for my work, and since then I have not only been on the lookout for an improved gas which would ignite with the said combination, but have become a firm believer in not delving in obtuse speculation, when a correct conception is obvious.

The real cause of luminiscence in rare metal oxids is in the high temperature which they attain and this high temperature is fostered in them by the faculty possessed by them in a higher degree than by any other material now known, of rapidly absorbing and tenaceously retaining heat.

What such a faculty means every mechanic knows, who under a tropical mid day sun has picked up a steel tool from a pine board. The one is blistering hot and the other comparatively cool from the same sources of heat.

It is therefore not unreasonable to assume that in the course of events or of natural evolution of things the oxid filament will supplant the carbon filament, notwith standing all the trouble that its inventor may experience at the hands of pirates and their backers; the thing will come, though the man may be cremated, before general industry accepts it.* Rational progress may be obstructed, but it cannot be stopped.

On the other hand, obstruction, when directed by powerful manufacturing interests, may considerably defer the final success of progressive invention. The commonest obstructive policy consists in the use of advertising patronage for preventing all or any information about the objectionable invention from reaching the public. Such patronage is of sufficient power for giving publicity to any obstructive statement which may be plausible; and when the agrieved party desires to correct misleading statements, such correction is "unavailable matter" for the patronized periodical.

Nevertheless, facts and truth have a peculiar way of their own for getting out and to public cognizance, and invariably they prevail before that court of last resort—Public Opinion.

A few words more should be said in relation to the so called Nernst lamp. It is a repetition of that, which the history of human progress has so often demonstrated, namely of a thing of no practical merit setting the world wild, requiring a good while to cool down to calm reasoning in appreicating the real value of the thing. A thing which requires heat from combustion to make a conductor and a luminant by means of an electric current, or needs two distinct electric currents and a mechanism for their substitution for the same purpose is not likely ever to substitute the simple vacuum lamp.

*Presumably the present employment of Dr. A. Werner and of Mr. Joe Hardwick, my former employees referred to, the one by Mr. Thomas A. Edsion and the other by the General Electric Company, may aid in such acceeptance.

Miscellaneous.

STRAY CURRENTS.

ELECTRICITY AS A CURE FOR INSECT BITES.

Galvanism is used by Dr. Friedlander, of Wiesbaden, to reduce pain and swelling from insect bites, the negative pole being place over the wound.

A NEW FILAMENT.

The new incandescent lamp filament of S. B. Husselman consists of a thread of asbestos upon which is fused a compound of aluminium and iodine. The process is claimed to be simple and inexpensive, and to produce a practically indestructible filament. The covering is applied as a pasty mass produced by heating aluminium and iodine with alcohol in a closed retort.

ACTINIUM.

Actinium is the name given a new radio-active element of the iron group discovered by A. Debierne in pitchblende. The substance has now been sufficiently concentrated to show that its rays have the same effect on barium platinocyanide, photographic plates, and a magnetic field as those of radium and polonium, while it is evidently distinct from those elements.

NOVEL MANNER OF ILLUSTRATING MAGNETIC REPULSION AND ATTRACTION.

Magnetic attraction and repulsion are illustrated in a very interesting manner in a new experiment devised by Professor S. P. Thompson. A circular coil of wire is placed with its axis horizontal in a tank of water, and a number of small bar magnets sealed into glass tubes are also dropped into the tank. The weight of the tubes is so adjusted that some just float while others just sink. When a current is passed through the wire, the magnets are attracted and sucked into the coil, and if the current is suddenly cut off and reversed as they are approaching, they are repelled and turn back. By careful manipulation the tubes seem simply to dart at and through the coil.

HIGH SPEED ELECTRIC RAILWAY IN GERMANY.

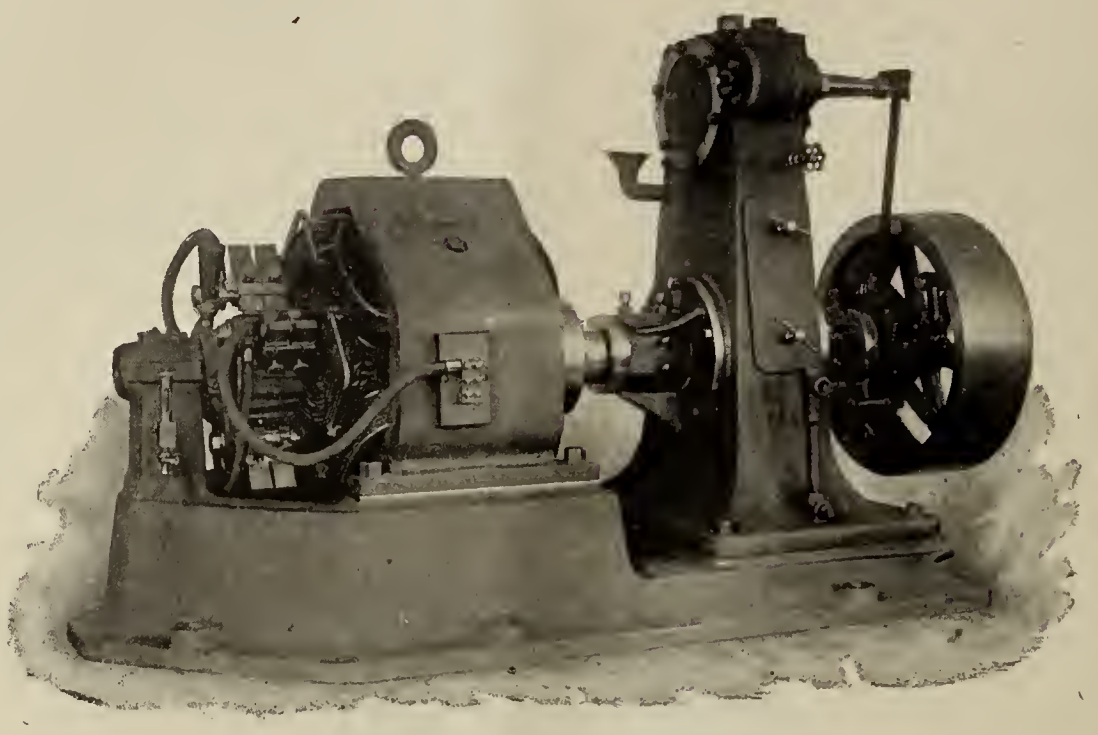
The problem of high-speed railways is being energetically attacked in Germany. A review of traction systems makes it appear that the speed limits with steam must be lower than with electricity, that the Heilmann steam-electric locomotive has proved unsatisfactory, that the accumulator system has yet many faults, and that the present most promising system is the ordinary one of supplying current from central stations to motors on the cars. A German society, now building an experimental line of nine miles, is to devote its entire capital of $375,000 to a study of the question.

Electric Light and Power.

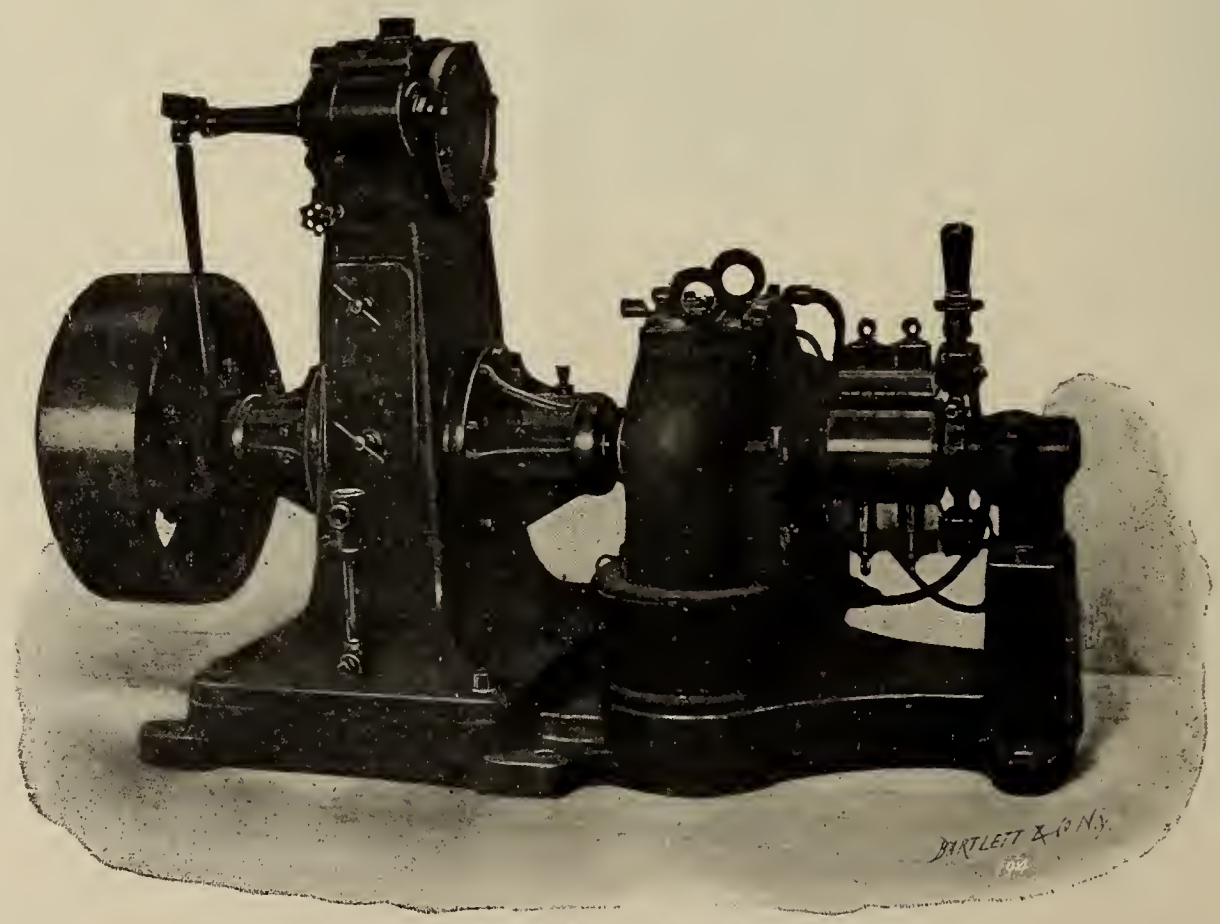
THE WEIGHT PER HORSE POWER OF DIRECT CONNECTED GENERATORS.

Some interesting facts have come to light regarding the weight per horse power of direct connected generators. With the improvements in construction that have crystallized of late, both as regards the engine and dynamo, the weight of both have been minimized to a degree far surpassing the expectation of our engineers. In addition to this lightness in weight is found a high degree of efficiency which speaks very well for the science of design in both fields, respectively, of mechanical and electrical engineering.

The facts at hand regarding the weight in pounds of direct connected plants built by one of the largest electric companies in existence are as follows: 4 K. W. machine, 1,020 pounds; 8 K. W. machine, 2,700 pounds; 20 K. W. machine, 5,650 pounds, and a 25 K. W. machine, 6,500 pounds. Comparing the first and last it is seen that with a 4 K. W. plant we have the weight of half a ton and with a 25 K. W. plant six and one-half times the weight. It seems as though these figures are in strict accordance with the first figures given. In other words, the weight of a large plant is in direct proportion to its power, as compared with a small plant.



Direct Connected Generator and Engine Outfit.



Direct Connected Generator and Engine Outfit.

The Electrical Age.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.

JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

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A NEW INSULATION FOR WIRE.

It is time for the manufacturers of electric wire and insulating material to turn their attention to a new product about to appear on the market called corn rubber. This material, produced from corn, has many of the chief characteristics as regards weight, strength, etc., of rubber, as commercially known. The corn oil from which the rubber is made comes from the germ of the corn and not the hull. This oil does not oxydize readily and seems to remain pliable for an indefinite period without cracking. When mixed with Para rubber the resulting material represents in every respect a high class type of rubber, applicable to the purposes to which rubber is put. In fact, in some respects the corn rubber is superior to caoutchouc. No tests have so far been made regarding its electrical properties, but there is a strong probability that it will be found as serviceable as an insulator as for anything else.

It is estimated that corn rubber can be sold at six cents a pound with a large profit and according to manufacturers already interested commercially it can be adapted to all purposes from bicycle tires to linoleum. The world's rubber supply is, of course, dependent upon climatic conditions in the tropical belt. When these vary to such a degree that the product is injured the price of rubber rises. These conditions could not exist were part of our corn crop devoted to this new purpose, namely the production of rubber. This would provide a new and growing industry for farmers and probably add largely to the prosperity of the south and west. The use of electricity which has but begun on a large scale will at least be quadrupled within the next twenty-five years and rubber will certainly play an important part during that period as an insulator.

ELECTRICITY IN MARINE SERVICE.

The adaptablity of electricity to many of the purposes on board ship where room and weight are great objects has led to serious consideration on the part of technical journals as to the possible application of electricity, not only for governing, steering and signaling, but for driving as well. The problem of marine propulsion by electricity is not a new one and although apt to cause a ghastly smile on the faces of electrical engineers it must some day meet with due consideration and experiments and tests will then be in order.

Prof. Hollis, in speaking of the power necessary to drive a vessel and the way in which it varies with the cube of the speed, etc., states: "The problem is like that of having a beast of burden whose maximum power will be that of an elephant but whose appetite is so adjustable that he could be economically used for work which could be performed by a donkey. You well know that an elephant would eat about the same whatever work he was doing, and while this is not exactly true of the steam engine or motor it nevertheless is true that its economy, when worked at powers which are so small a percentage of the maximum, is very much reduced."

The problem of equipping large vessels with storage batteries has been reviewed in past issues of The Electrical Age, but it may be stated in addition that yachts of considerable size and fine seagoing qualities have been built, equipped and thoroughly furnished for a long trip of from one to two days' duration, the motive power being entirely electricity. The automobile question and the electric boat question are very nearly of the same character, as far as time of operation is concerned. The disadvantage, however, on board a boat would be due to the possible accident to the storage battery and the subsequent helplessness of those on board.

Estimating on the basis of one hundred pounds per K. W. hour the reader will faintly realize that an ocean liner requiring ten thousand horse power, about seven thousand K.W. output per hour, would be forced to carry for each hour's service seven hundred thousand pounds of battery. While these figures are possible to criticism, and probably correction likewise, still the facts show that an enormous weight of storage battery would be necessary to move a great ocean liner. But, like all cases of a peculiar character, it might and would be necessary to modify the form of the cell to meet the exigencies of a case like this. The huge station cell now in use is certainly an example of the adaptability in size and construction of the cell to commercial conditions. Why not build huge cells for heavy service, such as would be required on board ship, provided an economical basis could be arrived at upon which to utilize them?

The magnitude of a machine has often stood in the way of progress, but in these days when engineering is carried on along lines of the most gigantic character the mere size of motors or batteries should not become a matter for serious consideration. Twenty years ago

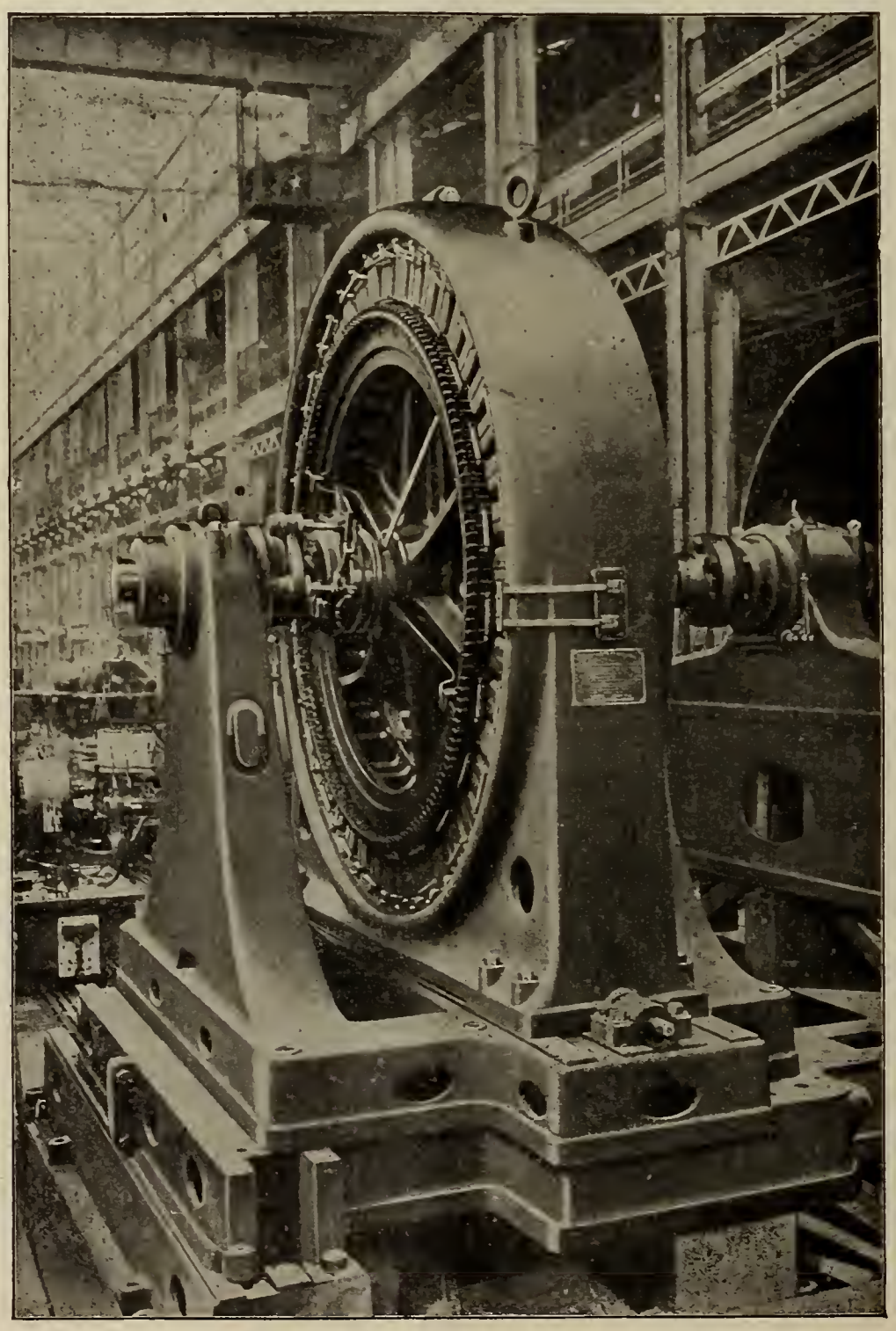
there were few, if any, fifty horse power motors in existence; no large generators and with the exception of telegraphic work little or no electrical engineering was done on a large scale. To-day everything is prodigious. At Niagara Falls we find five thousand horse power generated; transmission lines extend a distance of fifty, seventy-five and one hundred miles; searchlights of a million candle power are constructed and progress is hastening toward that point to which necessity and common sense are driving it. Interest in a like manner will some day be directed towards the propulsion of larger vessels than toy yachts or small pleasure craft.

TWO PHASE GENERATORS AT NIAGARA FALLS.

In the illustration is shown three Westinghouse, di-phase, 5,000 H. P. generators, installed at the power house at Echota. Number two was running at the time the photograph was taken. The switchboard gallery is shown with steps leading to it. The three Westinghouse generators have their fields fed with a continuous current from a pair of rotary transformers. Each generator has a separate switchboard with two sets of instruments, one for each of the di-phase armature circuits. The instruments in the top row are ammeters; in the second row voltmeters; in the third row wattmeters and in the fourth row is a single continuous current ammeter in the field circuit. On the switchboard are also phase indicators for connecting the machines in parallel. All the instruments are operated throngh transformers so that they are not in metallic connection with the 2,000 volt generator pressure. The main switches are situated immediately below the gallery and are operated by compressed air and controlled from the gallery.

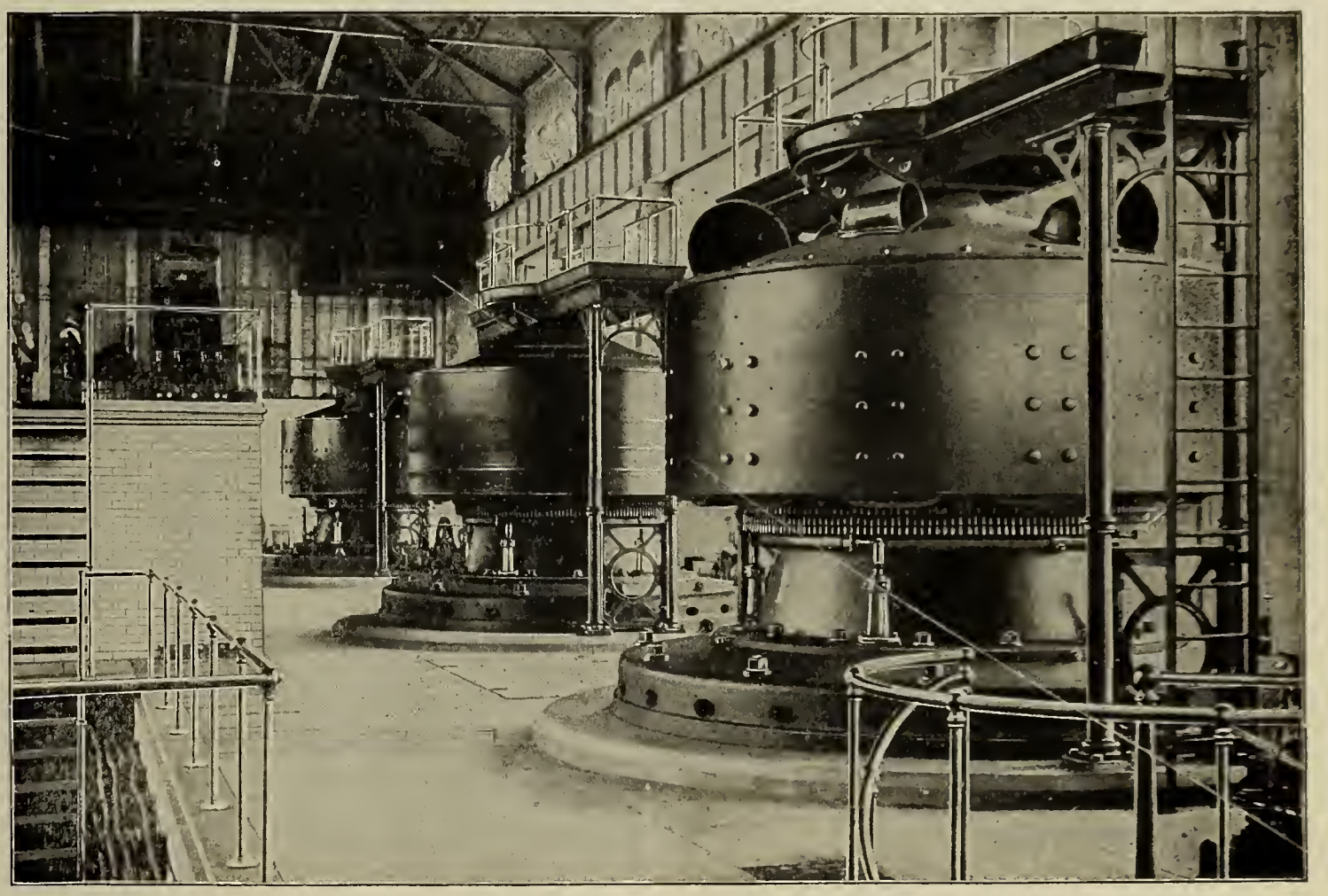
In the other illustration is shown one of the Westinghouse Company's di-phase, direct driven generators. This machine gives 1,200 K. W. at 1,200 volts pressure and runs at 180 revolutions per minute. It has forty poles; consequently the frequency of alternation is 7,200 per minute or 60 cycles per second. Each pole piece is made up of 1,600 soft steel plates, clamped side by side and cast into the field frame. The armature is ten feet in diameter and of the regular ironclad type with ventilating spaces.

The Westinghouse di-phases are also wound as tri-



Westinghouse Di-Phase Direct Driven Generator.

phases. In this case there are three collector rings on the shaft instead of four. The armature is tapped at three equi-distant points, 120 degrees apart, instead of in four, 900 degrees apart, as in di-phases, and one collector ring is connected to each of the three taps. Where two or more three-phase generators are installed in a station it is often important to operate them in parallel, that is to say, connect them together so that they all deliver their current simultaneously through a set of bus bars into the same circuit like incandescent lighting, continuous current generators or railway generators.



5,000 H. P. Westinghouse Generator Installed at Niagara Falls.

With alternators running in parallel it is necessary that they be in phase first as this is of more consequence than the equality of their pressure. If they are not in step at the moment of throwing them on the circuit a powerful current is sent through the armature, tending to bring it into step, and this may either blow the fuses or injure the machine. With multi-phases it is also important that they should be thrown into step phase by phase. At Niagara Falls every means is taken to facilitate without the possibility of risk all operations of this character.

HUNTING WITH THE AID OF AN INCANDESCENT LAMP.

A Lisbon paper describes a new invention hailing from Germany, which by its ingenuity will prove of great service in fox or badger hunting. A tiny electric globe is fixed on the neck of the dog who is to enter the burrow. The effect of this blue, green, or red light on the animal accustomed to live in its dark hole is considerable; it tries to escape, and the hunter who is watching at the mouth of the burrow has simply to shoot, and there is one less animal in the world! The little electric lamp is made on a private model, which its inventor has patented.

THE TELEPHONOGRAPH.

The "telephonograph," a new invention in which the German postmaster general, Von Podbielski, is much interested, is a combination of a telephone and a phonograph for the purpose of recording messages received during the absence of the operator. This apparatus was invented by a Dane by the name of Paulsen. The person called up has only to hold the trumpet to his ear upon returning to the office, even after an absence of days, to receive the message. Many inventors have tried to effect such a combination, but all failed on account of the difficulty of transferring the message onto a wax cylinder.

Instead of a wax cylinder, Paulsen used a flexible steel band in his phonograph, which is much simpler in construction than the Edison phonograph. Messages are much more easily removed from the steel band than from the wax cylinder. It is wound on two spools, moving quickly from one to the other, and coming in contact with a very small electro-magnet, switched into the circuit, which affects the steel band in such a way as to record on it any sounds that may penetrate to the phonograph. It is only necessary to cause the steel band to repass the magnet in order to have the sounds repeated. Each vibration of the electro-magnet produces a corresponding vibration of the steel band. In order to remove a message from the steel band, a magnet is passed over the surface on which the message was recorded.

The tests recently made in the engineering department of the Copenhagen Telephone Company, whose service the inventor has recently entered, were surprisingly successful. Up to the present time, the apparatus records a song better than a spoken message; but the latter is nevertheless quite clear, and the experts who have been making experiments in co-operation with the inventor

Literary.

THE NEW YORK CENTRAL'S VACATION REMINDERS.

The two booklets of the "Four Track Series," entitled "In the Adirondack Mountains" and "The Thousand Islands," issued by the passenger department of the New York Central and Hudson River Railroad are like a breath of fresh air during the hot spell and will make the most confirmed victim of the "stay at home" habit restless. These little booklets contain about sixty to seventy pages, giving descriptions of the most popular hotels at the various resorts reached by the New York Central, and also maps of these regions printed in colors, containing on the reverse side a complete list of the hotels and boarding houses, together with their dates of opening and closing and rates. Copies of the above will be sent on receipt of stamp.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED JULY 3, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

652,748. Electric Fuse. Francis A. Cote, Ottawa, Canada.

652,753. Electric Time-Recorder. Edward Davis, Boston, Mass.

652,761. Electrolytic Production of Caustic Soda, etc. Justus B. Entz, Philadelphia, Pa.

652,775. Alternating-Current Regulator. Daniel O. Hull, Port Clinton, Ohio.

652,922. Telephone Switch. Osgood Plummer, Boston, Mass.

652,928. Telephone-Exchange System. Walton Smith, Ridley Park, Pa.

652,977. Telephone. Joseph J. O'Connell, Chicago, Ill.

653,038. Incandescent Electric Lamp. Joseph Plechati, Berlin, Germany.

653,132. Circuit Controller. Henry Carleton, N. Y. City.

Business News.

NEW INCORPORATIONS.

Trenton, N. J.—The Standard Pole and Tie Company has been incorporated to deal in telegraph poles and railway ties.

Peru, Ind.—The City Lighting Company, of Peru, has been formed. Capital stock, $25,000; directors: Samuel V. Perrott, Henry C. Ulen, Jr., and Albert G. Perrott.

Utica, N. Y.—The Utica Fixture Company has been incorporated with a capital of $12,000 to manufacture gas and electric light fixtures. The directors are E. J. Milspaugh, A. C. Sieboth and Joseph Rudd, of Utica.

Masontown, Pa.—The Masontown Electric Light, Heat and Power Company, of Masontown, Fayette County, has been incorporated. Capital stock, $10,000; directors: Clarence K. Hartley, William C. Blackshere, Masontown; Charles A. Hartley, Ceylon, Pa., and Thomas L. Collier and Robert W. Playford, of Uniontow.n

New Brighton, N. Y.—The Richmond County Power Company, of Borough of Richmond, has been incorporated to supply electricity for producing light, heat and power; capital $500,000; directors: Samuel Thomas and William E. Findley, New York city; Morgan L. Ryan, New Brighton; Frederick T. Lewis, Arthur B. Proal, Jr., Norman P. Findley and J. H. Swinarton, West New Brighton.

Penn Yan, N. Y.—The Yates Electric Light and Power Company, of Yates County, with a capital of $300,000, has been incorporated with the Secretary of State. The company will supply electricity for producing light, heat and power for the village of Penn Yan and the towns of Jerusalem, Milo and Benton. The directors are: Henry B. Pierce, Walter Cox, Henry T. Howell, Frederick P. Delafield, Frederick W. Longfellow, of New York city; Cassius L. Haskell, of West New Brighton.

TELEPHONE CALLS.

Denver, Colo.—The Colorado Telephone Company has increased its capital stock from $1,500,000 to $3,000,000. The proceeds from the sale of stock are to be used for new extensions.

North Salem, N. Y.—The North Salem Telephone Company has been incorporated; capital, $500; directors: H. Hobart Keeler, Earle C. Bacon, Alfred Howe and David P. Vail.

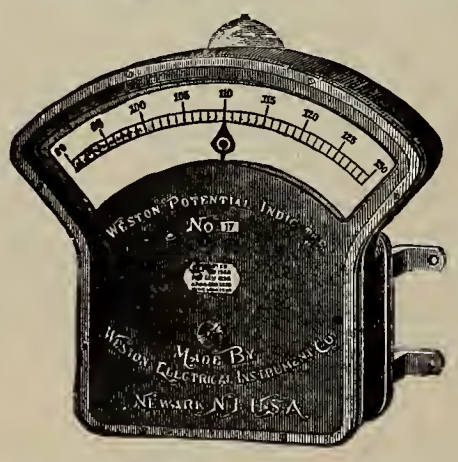
Menden Centre, N. Y.—The Centre Telephone Company has been incorporated to operate in Menden Centre, Rochester Junction and Honeoye Falls; capital, $600; directors: Edward P. White, B. H. Cole and Albert A. Lord, Menden Centre.

Greensburg, Ind.—The Decatur County Independent Telephone Company has been incorporated at Greensburg with $30,000 capital. It will fight the Bell system, against which there is considerable opposition on account of its high rates.

Cortland, N. Y.—The Cortland Home Telephone Company, of Cortland, has filed, with the Secretary of State, a certificate of incorporation. It is organized with a capital stock of $7,500, to operate in Cortland and Homer. The directors are Charles D. Vernoy, Willard M. Jones, George J. Mayer, William Marvin, Calvin P. Walrod, Herbert L. Smith, Howland L. Davis and Leland G. Foster, of Cortland, and William H. Foster, of Homer.

WESTON STANDARD ILLUMINATED DIAL

STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

114-120 William St., Newark, N. J., U. S. A.

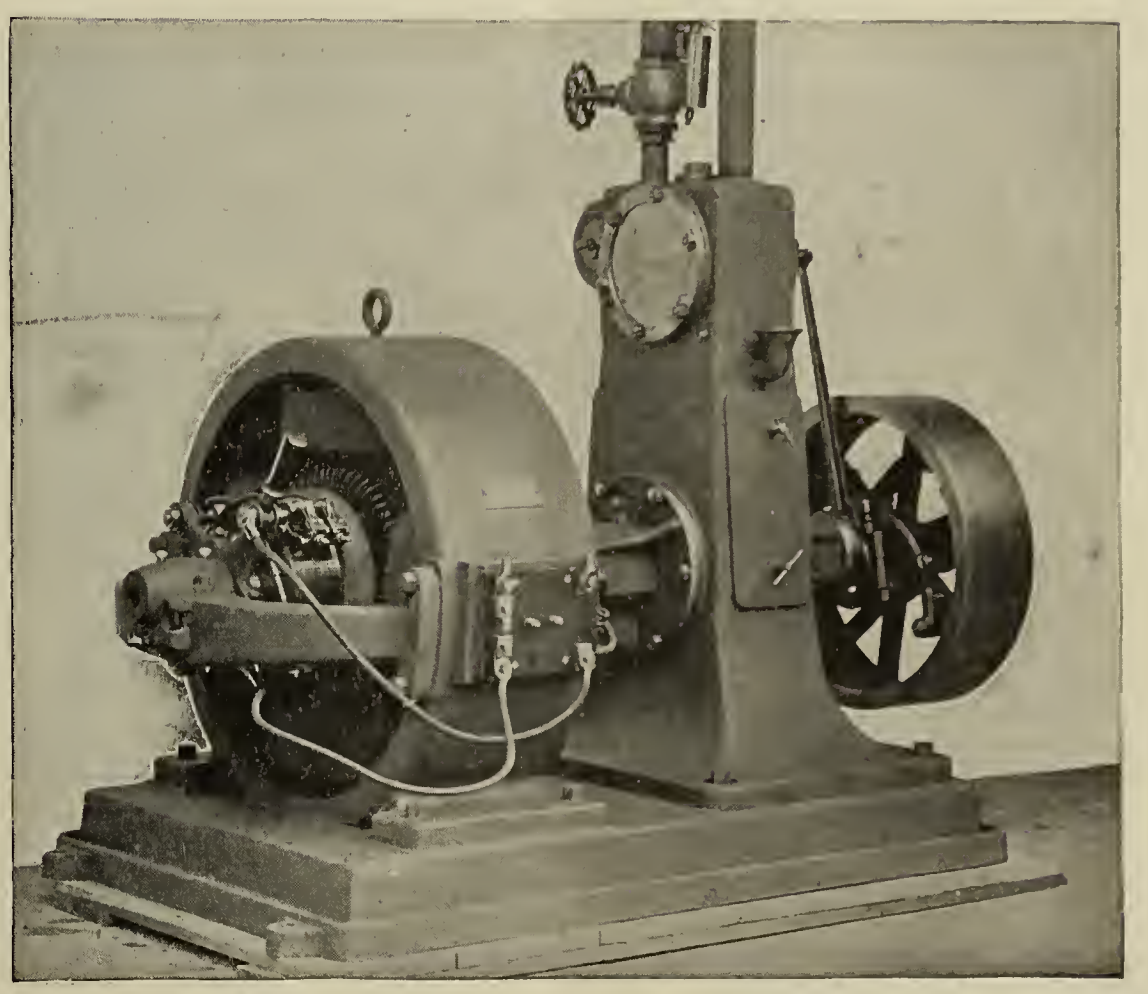
BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.

LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

VOL. XXVI—No. 3. NEW YORK, JULY 21 1900 WHOLE No. 688.

Direct Connected Electric Light Plants.



Small Direct Connected Engine and Generator Plant Installed in a Seaside Residence.

ELECTRIC LIGHTING IN SUMMER HOMES.

The manufacturing industry has interested itself sufficiently in the requirements of summer homes, as far as light is concerned, to place upon the market small direct connected plants, easily transported and readily installed for temporary use.

In the illustration is shown an outfit of this desrciption. Both engine and generator are mounted on a common but independent bed-plate. They are united by a flange coupling. This generator is of the four pole type. It is compound wound and has four sets of carbon brushes which press in a radial direction upon the commutator. Modern generators of any dimensions for even larger plants are made multipolar for the reason that the output is greater for the pound of material and for a given floor space with generators of the multipolar type than with those of the bi-polar type, since the magnetic circuit, being divided into a number of symmetrical streams, is more compact.

The machine shown has an output of four kilo watts, running at 650 revolutions per minute and weighs, with the engine, 1,450 pounds. This installation was installed recently on the lower floor of a cottage at Long Branch, N. J. The boiler was dispensed with as steam was obtained by contract through the laying of a pipe from a neighboring hotel and the operation of the plant was left to the care of the man of all work about the house whose severest labor in connection with the light system is to turn on or shut off steam and see that the engine is kept well oiled. In the fall the plant will be moved back to the city, protected from the dampness and other corroding influences.

Instead of suffering from the inconveniences of poor lighting and the risks of fire, which are very great in a frame cottage through the use of kerosene or even acetylene, it would be an excellent plan for those living by the sea to investigate propositions of this character which would prove in the end to be both safe and economical.

Light Phenomena.

DIRECT METHOD OF MEASURING X-RAY INTENSITIES.*

BY DR. FREDERICK STRANGE KOLLE.

The present fluoroscopic, photographic and ionization methods of measuring the intensities of Roentgen rays are, more or less, subject to such inaccuracies as to make them very unsatisfactory.

The faults are due primarily to variations in the generating apparatus and secondly, to the difference of ray intensities given off by a tube used as a standard, whilst in the photographic process the several chemical processes produce results, however slight, that occasion often visible variations.

To Mr. Perreau** we owe the discovery that selenium is acted upon by the rays in somewhat similar manner as ordinary light, except that the action is not as active, or powerful, if you please.

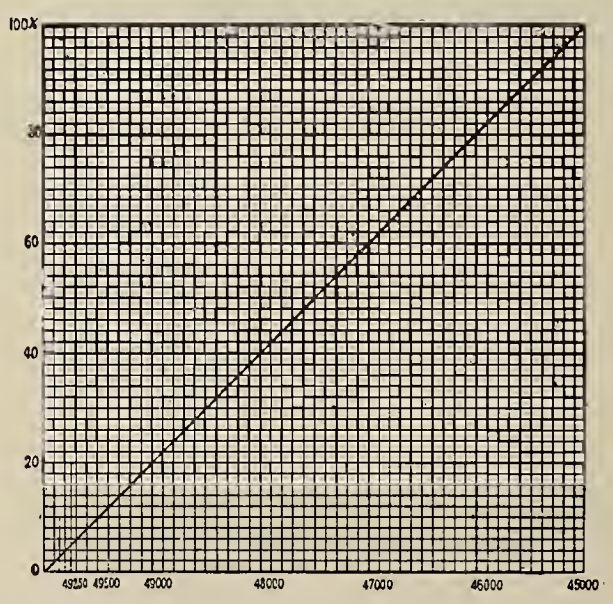
Knowing that electric waves have no influence on selenium, it becomes at once an agent applicable to the direct method of measuring the intensities of x-light. Again the simplicity of the apparatus recommends it to the general physicist.

The apparatus to be employed is made up as follows:

A disc or strip of selenium, such as is furnished by manufacturers for experimental purposes is inclosed in a hard rubber case having a thin aluminum shutter on the side to be brought in close proximity to the active tube. A hard rubber rod, six inches in length, supports the case from the base plate of wood.

Two copper strips or wires are connected to the selenium at the top and bottom and attached to binding posts placed under the cases, to which one of the wires from the battery and the galvanometer are connected.

A battery of 10 chloride of silver cells is introduced between one binding post and the galvanometer.



The galvanometer should be of the mirror type.

The contact key is placed in circuit to facilitate the making and breaking of the current.

To increase the x-light intensity the resistance of the selenium is first noted.

The apparatus is then brought near the tube with the aluminum shutter facing the latter at a distance of two inches.

The tube is put into action and the resistance of the selenium cell is again measured after the oscillation of the reflected light ray has assumed a minimum. A decided difference in the resistance of the selenium is noted, varying, if in the first measurement it corresponded to 50,000 ohms, as much as 6,000 or 7,000 ohms.

In calculating the resistance of disc let

R= resistance of selenium disc (normal)

Rx = resistance of selenium disc (x-ray)

D = deflection corresponding to R

Dx = deflection corresponding to Rx

then the galvanometer deflection varies inversely as the resistance, or,

$$Dx : D : : R : Rx$$

from which

$$Rx = R\frac{D}{Dx}$$

If, for the matter of standardization the maximum resistance reduction with an x-ray tube is assumed as 5,000 ohms where a disc of 50,000 ohms normal resistance has been employed, then the former represents 100 per cent. and the latter 0, (zero) x-ray intensity.

A table, as follows, may be prepared by which the efficiency of a tube can easily be computed:

X-Ray Intensity. Per Cent.	Rx
0	50,000
10	49,500
20	49,000
30	48,500
40	48,000
50	47,500
60	47,000
70	46,500
80	46,000
90	45,500
100	45,000

In like manner a chart (as shown in Fig. 2) with the values given and intermediate values could be prepared from which the tube efficiency can be read off directly.

Brooklyn, N. Y.

*From "The American X-Ray Journal."

**Perreau. Comp. Rend. 129 pp. 956-57.

PHENOMENA MET WITH IN PHOTOGRAPHING LIGHTNING.

In attempts to photograph lightning flashes at Dover, England, Mr. S. Webb has stumbled upon a very curious phenomenon. The field of the camera included a number of arc lights, and on developing the pictures it was found that an irregular luminous line passed from each lamp to the ground whenever a flash occurred in the clouds. On one occasion, he has since succeeded in seeing, with the unaided eye, a stream of electricity descending from an arc lamp. The pictures have interested Sir George Stokes, who notes that the iron lamp-posts may have had some effect by attracting atmospheric electricity, and that the discharges may have been influenced by an underground high-tension electric cable toward which they seemed to pass. He thinks this may be a case of Nature's wireless telegraphy. The resisting air about the lamp seems to act like the coherer of the telegraphic receiving apparatus, a difference of electrical condition or potential between the lamp and some other point may take the place of the battery current that is held in restraint by the coherer and the electro-magnetic waves from the flash may open a path for the current through the air as in the coherer.

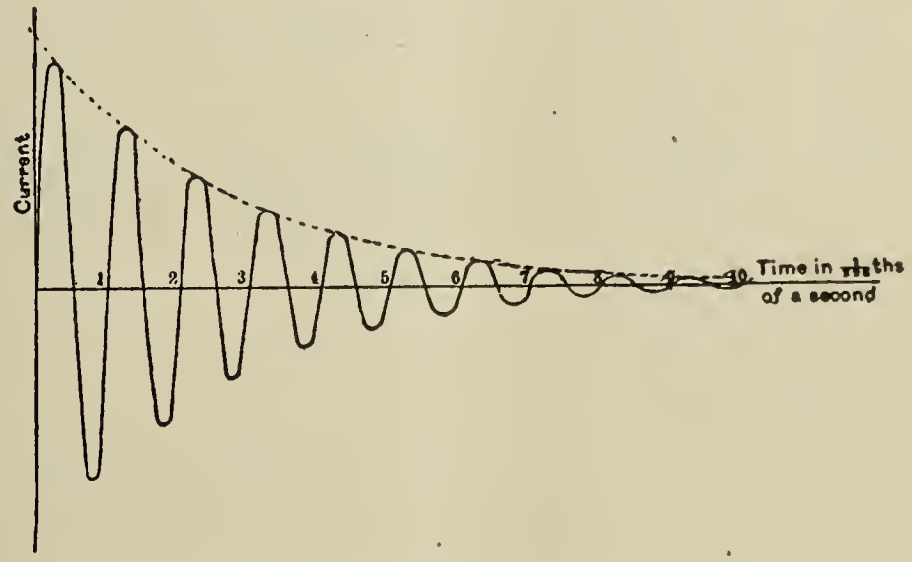
Buffalo, N. Y.—The Kensington Automobile Manufacturing Company, of Buffalo has been chartered to manufacture automobiles. Capital, $600,000; incorporators, W. J. Knowles, C. G. Shepard, J. A. Roberts, H. P. Bissell, all of Buffalo.

Condensers.

THE BRUSH DISCHARGE.

The discharge in air from an isolated conductor which is charged up to the limit set by the electric strength of the air is, in some respects, different in character from the spark discharge between two oppositely charged conductors which are not too far apart. In this case the lines of stress, before the rupture starts, diverge, the intensity of the field growing less and less at greater distances from the conductor.

For some unknown reason the brush forms more readily from a positively charged conductor than from one which is negatively electrified. The positive brush is very different in character from the brush on a negatively charged conductor. This is, no doubt, due to the properties of air rather than to any difference between positive and negative charges.



Oscillating Discharge From Condenser.

In the illustration is shown, diagramatically, an oscillatory discharge from a condenser. This discharge, as indicated, is a degenerating series of alternations, their amplitude governed in each case by the resistance and self-induction of the medium through which the discharge occurs. In his work entitled "The Reactions of Condensers" Nikola Tesla enters fully into an experimental proof of the peculiar character of a discharge from condensers of various capacities.

Many of the higher phenomena of an electrical nature are clearly shown and apparent paradoxes produced highly interesting to the eye and mind. It has been calculated that the oscillations may reach and exceed forty millions per second from a Leyden jar of moderate dimensions. According to the electro-magnetic theory of light, given an infinitessimal condenser discharging at a certain specified rate and luminiscence is produced, theoretically and practically identifiable with the light of day.

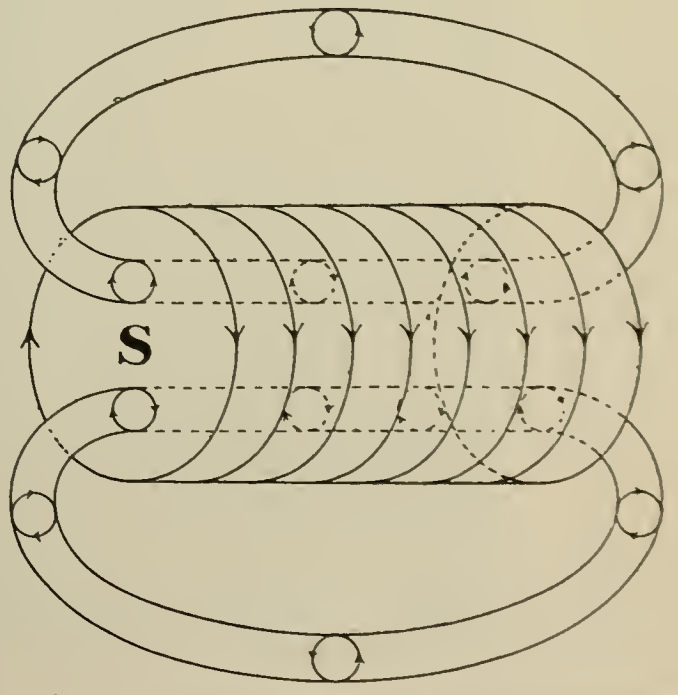
Electricity and Magnetism.

MECHANICAL CONCEPTION OF ELECTRICITY AND MAGNETISM.

The ether is to be considered as built up of very small cells of two kinds, positive and negative, in such a way that only unlike cells are in contact. These cells are imagined to be so connected where they are in contact that if a cell be turned while the adjacent cells are kept stationary then a torque, due to elastic reaction of adjoining cells, is brought to bear upon the turned cell which tends to right it and which is proportional to the angle turned. The conception of the magnetic field is as follows: The ether cells, at a point in a magnetic field, are to be thought of as rotating about axes which are parallel to the direction of the field at that point, the angular velocity of the cells being proportional to the intensity of the field at the point.

The positive cells rotate in the direction in which a right handed screw would be turned, that it might move in the direction of the field, and the negative cells rotate in the opposite direction. This opposite rotation of positive and negative cells is mechanically possible since only unlike cells are in contact. All the positive cells rotate clockwise and the negative cells counter clockwise. The kinetic energy per unit volume in such a system of rotating cells is consistent with the fact that the energy per unit volume in a magnetic field is proportional to the square of the intensity of the fields.

Illustrations are shown of the relations existing between the flow of current and the lines of force under the various circumstances; with the current circulating with the hands of a clock, the lines of force enter that end of the coil emanating from the other end at which

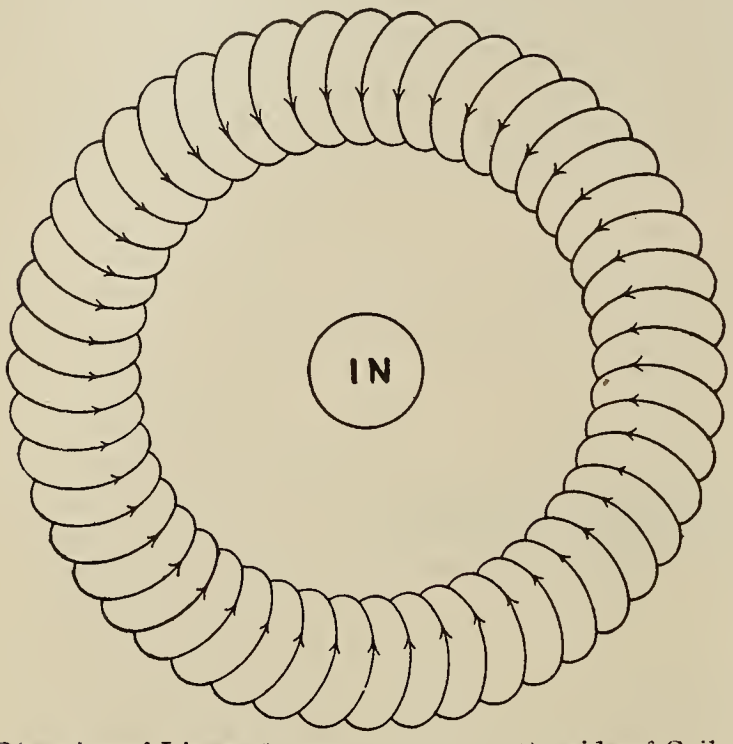


Direction of Lines of Force With Reference to Current.

the current circulates against the hands of a clock. Referring again to the cells the work transmitted from one to the other of three adjacent cells is dependent upon the

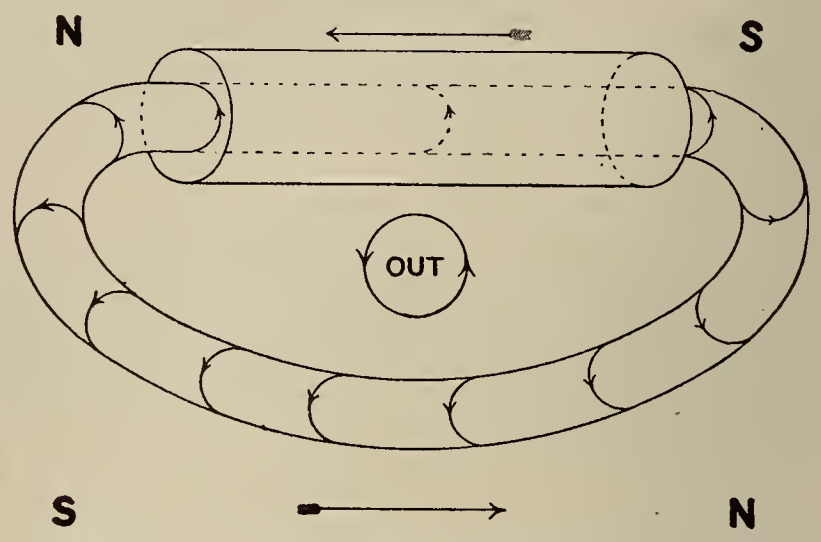
direction of turning and torque action and the rate of transmission at work will be proportional to the product of torque action into speed.

With a group of cells rotating alternately in opposite directions we have what constitutes a magnetic field, in which, on account of the torque action between the cells, energy will be transferred to the right or left at a rate proportional to the product of the intensity of the magnetic field into the intensity of the electric field. The energy per second flowing across an area perpendicular to both electric and magnetic fields is proportional to the product of the respective field intensities into the area. The energy per unit area per second is therefore proportional to the product of magnetic and electric field intensities.



Direction of Lines of Force Inside and Outside of Coil.

flowing; the wire viewed from each side presents a magnetic field of opposite direction. Since an electric current may be maintained for an indefinite time this opposite rotation of positive ether cells on the two sides of



Direction of Lines of Force at the South Pole of a Helix.

the wire cannot be due to an ever increasing ether distortion, but there must be a slip between adjacent cells. This slip between adjacent ether cells, positive and negative cells, takes place in the material of the wire and constitutes the electric current.

POINTS ON ARMATURE CONSTRUCTION.

The modern type of dynamo electric machine is almost always rionclad. An ironclad armature gives better mechanical support to its conductors and is in every respect stronger than an armature of the smooth cored type in which the conductors are carried over the surface instead of being imbedded in slots. Moreover, the mag-



Winding a Toothed Armature.

In response to the question "What Is an Electric Current?" we must consider a wire along which a current is

netic pull upon the armature of a dynamo electric machine is exerted upon the conductors when these lie on

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., } ELECTRIC LIGHT AND POWER.
OSBORNE P. LOOMIS, E. E., }
JOSEPH MUIR, M. D., } ELECTRO-
FREDERICK STRANGE KOLLE, M. D., } THERAPEUTICS.

ADDRESS ALL COMMUNICATIONS TO
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THE IMPORTANCE OF SUBMARINE CABLES IN WARFARE.

To underestimate the value of an armament in actual warfare is as bad as an overestimation of its qualities. In the recent struggle which took place between the United States and Spain it was interesting to note the influence exercised by what might be considered in these times an indispensable element of communication, namely, the submarine cable.

Captain George Owen Squier, of the United States Signal Service, who has earned fame in connection with Crehore, in inventing and showing the application of the synchronograph, reviewed the importance of the submarine cable in naval warfare before the Naval War College, in Newport, R. I. According to the New York Sun, Captain Squier adduced from our late war with Spain a remarkable example of the influence that may be exerted by a submarine cable on the fortunes of a particular fleet and consequently on a nation's ability to prolong a contest.

He pointed out that the accidental non-delivery of two cable messages from the Spanish Minister of Marine to the commander of the Spanish squadron then lying at Martinique was mainly chargeable with the destruction of Cervera's warships and with the subsequent request for peace on the part of the Madrid government. One of these telegrams informed Cervera that a coal supply was near at hand and the other granted him permission to return at once to Spain. The non-delivery of these telegrams led to the destruction of Cervera's ships and the final acquisition by this country of Manila.

Outside of this fact it is well to realize how great an advantage it is to any nation to be able to communicate directly with the seat of war across continents and seas. It is a question to be decided largely by the flexibility of the cable system, its widespreadedness, as to whether suppiles reach their destination, or, more important in some cases, whether coal is ready on request. Captain Squier shows that England owns the great cables of the world, four-fifths of which are in her control, with many extensions in view which would make the British signal system on land and sea equatorially complete.

It is strange to realize that Americans, to whom belong the honor of having invented the most perfect telegraph system in the world, should not pay more attention to future national requirements in the light of the enormous importance a complete cabling system may have upon the history of this great republic.

THE IMPROVEMENT IN FUSES.

The uncertainty existing in relation to fuses for the protection of electric circuits has been obviated to a large extent by the use of other metals than that commonly known as fuse wire and the employment of devices which automatically disconnect or open the circuit when it suffers from an overrush of current. Protected fuses not influenced by changes of temperature are most advantageous and certain in their stated point of fusion. On the other hand, the employment of copper for this purpose is attended by many benefits. In the Edison Illuminating Company's station copper fuses may be seen in the subway system or at least where such wires connect with those in the building. On the other hand, fuses have been manufactured of late by firms possessing a better scientific knowledge, a more thorough insight into the conditions governing each case.

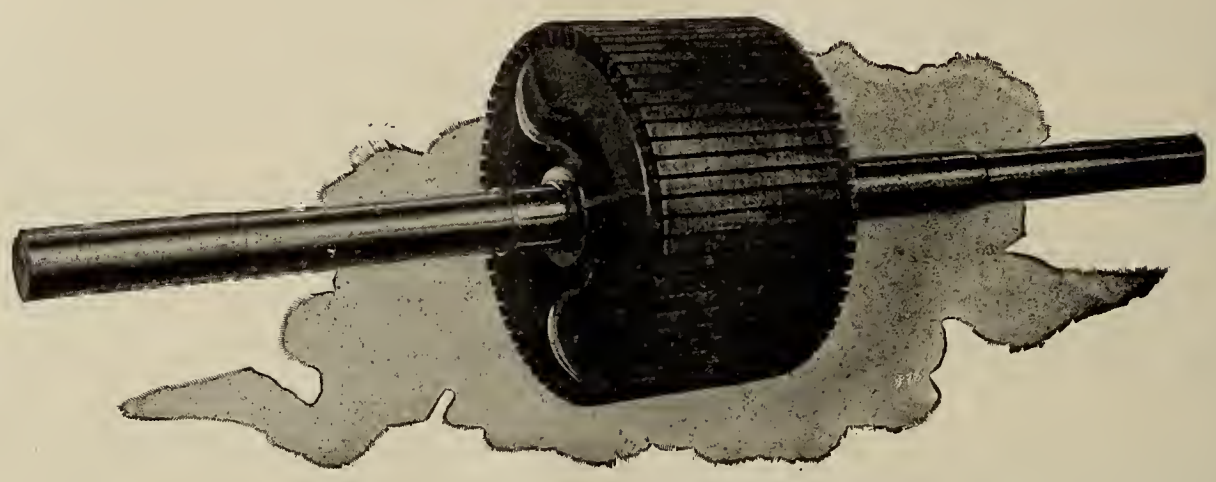
While a fuse wire is a safety valve essentially it must act as well as a safety valve. These indispensable adjuncts to steam plants will not blow off steam fifteen or twenty pounds under or above the point at which they are set. The engineer is thereby saved much inconvenience, and the same should be true of the safety fuse. At one time it was customary for contractors to arrange fuses in the upper part of the room, near the ceiling. Here a layer of hot air would raise the temperature of the fuse ten or twenty degrees and cause it to blow with a lighter load than was expected. Or again, if the fuse was near enough to an open window to be affected by the draught in winter its point of fusion would be questionable.

The importance of using fuses of exactly the rated capacity was fully appreciated by conscientious engineers, particularly those in charge of theatre lighting plants or the lighting of any public building. Such heroism as that of an engineer standing by his dynamo with a wrench pressed against the terminals, where once the main fuse had been, is an overdrawn picture of carelessness and ignorance. It is as important for an engineer to see that the fuses in the building in his charge are correct in every respect as those other duties considered by many of greater moment.

the surafce of the core, as in smooth cored armatures, but it is exerted almost entirely upon the iron teeth when the conductors are buried in slots, as in ironclad or toothed cored armatures. Consequently, smooth cored armatures are not only structurally weaker than tooth cored armatures but are also more liable to be mechanically injured by unduly powerful magnetic forces.

The process of winding an ironclad armature of a hundred kilo watts, belonging to an octopolar or eight pole machine, with wire conductors, is represented in the illustration. The core of a slotted armature free from winding is also shown. The various processes of insulating and preparing the core preparatory to winding are of the greatest interest. Care is taken in winding both smooth cored and slotted armatures that the weight is equally distributed all over the core, thereby preventing a disagreeable jarring and vibration threatening the integrity of the machine due, in common phase, to an "unbalanced armature."

On the other hand, ratios must be established between the thickness of the air gap and the width of the slots. These ratios, determined a priori by experiments with other types, exercise a great influence upon the degree of usefulness of which the machine is capable. Heating in the core and pole piece and sparking at the brushes may be eliminated by a design worked out with reference to these facts. The radiating surface of the armature core as well as the capacity of the conductors for current should be such that no excessive heating will take place, no rise of temperature threatening the insulation or conductors.



Slotted Armature Core Without Winding.

Opportunities for American Trade Abroad.

ELECTRIC WORKS IN BOMBAY.

Almost every mail brings me letters from American electric manufacturers and exporters asking for information and the names of agents to handle their productions. I would be glad to furnish these were they to be had in this consulate. In all India, Madras is the only city where electricity is used as a power for street railroads. Bombay's tramways are run by horsepower, and the city is lighted by gas. Electricity is used only in a limited way; in some of the better houses and bungalows and on an occasional fete or holiday, a public park may be lighted by a portable electric plant. The general merchant and dealer is not sufficiently acquainted with electric manufactures to make a successful agent, and, besides, the demand for goods of this line is quite limited.

Bombay is an immense city, with land and sea shipping equal to the best. It has large commerce and trade and manufacturing interests. Its buildings are said to be the finest in India, and much wealth is centered here. The appalling density of its population and the exorbitant rates of rental must find relief in cheap and rapid electric transit. Electricity as motive power and light must come soon, and I hope our manufacturers and capital seeking new fields of profitable and safe investment will look well to this opportunity.

The Bombay Tramway, an American company with head office in New York, some time since applied to the municipality for the privilege of converting its power into electricity. This has not as yet been granted. The municipal commissioner, W. L. Harvey, has declared his intention of giving the city electric lighting, and the matter is now open for bids and offers. For the information of those interested, I inclose a letter from the municipal commissioner and a copy of preliminary contract on the subject of the electric lighting of Bombay. I might add that three or four local firms have tendered bids. These firms, I understand, are simply representatives of European capitalists and electric-construction companies. I might further say that India possesses an inexhaustible supply of coal, and, while it is inferior to the Welsh coal, yet it is correspondingly cheaper and considered very good for steam purposes. It sells at this port for from 13 to 16 rupees ($4.25 to $5.25) per ton, according to the quality.

The cost of transportation of electric supplies and apparatus from our shipping ports to Bombay could be greatly lessened by freighting in sailing vessels around the Cape. This would also avoid Suez Canal tolls, and, by judicious management in shipping, the extra time taken would not be felt. Under the Indian tariff code, a large proportion of an electric plant would enter duty free. However, the question of tariff would not figure in competition for the contract, as all companies are treated equally.

I wish to add that I will do all in my power to aid and further American interests, and would impress upon any company wishing to enter upon this field the absolute necessity of sending reliable agents to represent it.

WILLIAM T. FEE, Consul.

Miscellaneous.

STRAY CURRENTS.

A NEW METHOD FOR TREATING ARC LIGHT CARBONS.

A new treatment of arc light carbons, patented by J. T. Robinson, is claimed to increase the durability, improve the light, and lessen the consumption of energy. The carbon pencils are soaked two to four days in a solution of caustic soda or potash containing powdered talcous asbestos.

STIMULATING EFFECTS OF ELECTRICITY.

All organs of sense are stimulated by electricity, Dr. J. Mount Bleyer points out. In the retina it excites sensations of glare and dazzling, in the ear it produces a peculiar buzzing noise, in the tongue it gives a very characteristic metallic sensation, and in the nose it creates sneezing irritation and an odor of ammonia.

THE EFFECTS OF ARC LIGHTS UPON PLANTS.

The commercial use of the electric arc in the culture of Easter lilies is shown by Mr. M. G. Kains to be quite practicable, but he finds that this light should not be used until the lily buds are an inch long, and that it should then be passed through glass to screen out the ultra-violet rays. In the experiments considered, a dark brown burn appeared on the plants under the naked light. The light was continued nightly for four months, giving plants that were taller and earlier in blossoming, but less robust and with shorter-lived flowers, than those grown in the dark.

ITALIAN ELECTRIC CARTRIDGES.

Consul Hughes, of Coburg, says: An Italian electrician has invented an electric cartridge, which he offers as a substitute for dynamite and smokeless powder in mines, rock blasting, and for heavy ordnance. The composition used in the cartridge is made up of carbonates of potash and chloride of ammonia, the proportion varying according to the use. The discharge is effected by an electric spark, which produces electrolytic effects upon the chemicals. The inventor claims that the cartridges, until subjected to the effect of electricity, are entirely inoffensive and perfecly safe; so that there will be no necessity for isolating the magazines where they are stored.

MEASURING THE EFFECT OF VIBRATION UPON ACCUMULATORS.

To test the effect of vibrations on accumulators and electrical measuring apparatus, the Central Laboratory of Electricity, in Paris, has devised a table that can be given practically the same jolting that an automobile in action receives. The table is supported by eight springs in pairs at the four corners. Under the table are two tappets that are raised by cams on a shaft driven by a 2-speed cone pulley, and by varying the relative position of the cams and the tension of the springs, as well as the speed of the shaft, a great range of vibrations can be given.

SENDING ETHER WAVES THROUGH LIQUIDS.

M. E. Branly, the inventor of the coherer, has been experimenting upon Hertz waves through liquids, and, in a short paper before the French Academy of Sciences, gives his results as follows: The coherer was placed in the middle of a large glass recipient containing the liquid to be tested, and was moved away from the source of waves until no effect could be noticed. It was found that distilled water and ordinary river water possessed a higher absorbing power for these waves than either oil or air. The effect of sea water was notably large, and strata of this not more than about one foot thick seemed to be sufficient to completely absorb Hertz radiation. Its absorbent power is greater than that of an equivalent layer of cement.

ELECTRIC FISH OF THE NILE.

The electrical organ of the Malapterurus electricus, the formidable electric fish of the Nile, is situated in the skin enclosing the entire body, and consists of rows of compartments, each having a peculiar protoplasmic disc with a projecting stalk. The total number of these leaf-like discs is 2,000,000. Each half of the organ is connected to a single nerve fibre, and late investigations show that the power of the shock—reaching a maximum of 200 volts in a fish eight inches long—is due to the simultaneous development of similar electromotive changes in all the discs. The electrical disturbance in a single disc is about the same as that in ordinary nerves. The shock consists of a rhythmical series of rapid impulses, and the interval between the shocks increases from a tenth of a second to several seconds as the animals becomes fatigued. The organ as a weapon is likened to a self-loading and self-discharging automatic gun.

Business News.

NEW INCORPORATIONS.

Rhinebeck, N. Y.—The Dutchess Light, Heat and Power Company, of Rhinebeck, has been chartered to manufacture electricity. Capital, $20,000; directors: George N. Miller, Thaddeus A. Traver and Frank Herrick, Rhinebeck.

Colorado City, Colo.—The Colorado City Electric Light and Power Company has been incorporated with a capital of $10,000. Charles M. Sherman, Charles L. Cunningham, Charles E. Corcoran, Morton Drake and John R. Watt, Colorado City, are the directors.

Gilsonburg, Ohio.—The Gilsonburg Electric Light Company, of Gilsonburg, has been incorporated to furnish electricity for light, heat and power. Capital, $12,000; incorporators: H. W. Mohroff, F. H. Westhoff, C. Sanders, L. Gerwin, H. Feehrmeyer, A. Miller.

Middletown, N. Y.—The Neversink Light and Power Company, of Middletown, has been chartered to manufacture electricity and gas for light, heat and power. Capital, $100,000; incorporators: P. A. Rorty, W. J. Burke, H. C. McBriar, all of Middletown.

Pittsburgh, Pa.—The Pittsburgh Electrical and Machine Works, of Pittsburgh, has been incorporated for manufacturing electric appliances. Capital, $60,000; incorporators: C. Schuster, F. Marzolf, both of Bellevue; C. K. Bergmann, H. C. Haslage, J. M. Goehring, all of Allegheny City.

Cementon, Pa.—The Cementon Electric Light and Power Company, of Cementon, has been chartered to furnish light, heat and power. Capital, $10,000; incorporators: J. S. Wentz, of Mauch Chunk; G. D. M. Creary, W. B. Whitney, both of Philadelphia; A. C. Leiseming, of Upper Lehigh; T. M. Righter, of Mt. Carmel.

New York City.—The Richmond County Power Company, of the Borough of Richmond, has been incorporated to supply electricity for producing light, heat and power. Capital, $500,000; directors: Samuel Thomas, Wm. E. Findlay, New York city; Morgan L. Ryan, New

Brighton; Frederick T. Lewis, Arthur B. Proal, Jr., Norman P. Findley and J. H. Swinarton, West New Brighton.

Laporte, Mich.—The Laporte and Michigan City Railway Company has been incorporated with headquarters in Laporte. Its capital stock is $300,000. J. A. Brett, of Chicago, is president of the company; A. L. Searle, of Chicago, is secretary, and L. B. Bradley, of Chicago, is general manager. The other directors are: A. M. Hewes, of Chicago, and M. H. Weir, E. F. Michael and L. T. Harding, of Laporte. The company will operate an electric railway between Laporte and Michigan City, a distance of about fourteen miles. The road will be built this summer.

TELEPHONE CALLS.

Boone, Iowa.—The Boone Telephone Company filed articles increasing its capital stock from $30,000 to $75,000.

Nacogdoches, Tex.—The Texas Gulf Telephone Company, of Nacogdoches, has been organized with a capital stock of $100,000. Incorporators: E. C. Branch, George H. Davidson and K. P. Branch.

Brenham, Tex.—The Brenham and Brazos Valley Telephone Company, of Brenham, has been chartered with a capital stock of $2,000. Incorporators: D. C. Giddings, Jr., W. M. Aren and O. A. Seward.

Webster City, Iowa.—The Chamberlain Independent Telephone Company, of Webster City, has filed articles of incorporation. Its capital stock is $20,000. A. W. Chamberlain is president and treasurer, and J. W. Lee, secretary.

Greenburg, Ind.—The Decatur County Telephone Company, of Greensburg, has been formed to operate telephone lines. Capital, $30,000; incorporators: J. Shanks, M. Spilman, J. S. Shaw, all of Greensburg.

Glens Falls, N. Y.—The New Union Telephone Company has been chartered to operate between Glens Falls, South Glens Falls, Sandy Hill, Fort Edward and the adjacent towns and to Albany and Troy. Capital, $100,000; directors: B. B. Fowler, L. M. Brown and Arnold Wurtenberg, Glens Falls.

STREET RAILWAY NEWS.

Slatedale, Pa.—The Slatedale Street Railway Company has been chartered to operate a street railway between Slatington and Slatedale, Lehigh County. The length of the road is about four miles. The capital stock is $50,000. The incorporators are: Francis J. Crilly, John L. Schwartz, Patrick F. Cannon, Francis A. Kreitz and Walter J. Sager, all of Allentown.

Edwardsville, Ill.—Articles of incorporation have been issued to the St. Louis and Illinois Electric Railway Company, with its principal offices located at Edwardsville. The capital stock of the corporation is $2,500 and the object is to construct an electric railway from East St. Louis, St. Clair County, to Edwardsville, Madison County, by way of Collinsville, Venice, Granite City and Horse Shoe Lake; with a branch from Collinsville to Belleville; a branch from Venice to Edwardsville and Highland, by way of Glen Carbon, in Madison County, and a branch from Collinsville, in Madison County, to Lebanon, in St. Clair County. The incorporators and first board of directors are: Ferdinand Vorwald, C. N. Travous, W. M. Warnock and George D. Burroughs, of Edwardsville, and Fred Kohl, Theodore F. Meyer and A. H. Smith, of St. Louis.

Cleveland, Ohio.—An important consolidation of northern Ohio electric railway interests has been accomplished, the Cleveland, Elyria and Western Railway Company being formed by the consolidation of the Cleveland, Berea, Elyria and Oberlin Railway Company, the Lorain County Railway Company and the Oberlin and Wellington Railway Company—all being electric traction companies. The capital stock of the combined company is fixed at $2,000,000. The directors are: A. H. Pomeroy, of Berea; S. C. Smith, of Cleveland; Will Christy, Akron; M. A. Sprague, Berea; L. M. Coe, Berea; F. L. Fuller, Elyria; H. Q. Sargeant, Cleveland; M. J. Mandelbaum, Cleveland; O. D. Pomeroy, Berea, and F. T. Pomeroy, Cleveland. The officers are: A. H. Pomeroy, president; A. E. Atkins, vice-president; E. F. Schneider, secretary, and F. T. Pomeroy, treasurer.

LEGAL.

Galveston, Tex.—In the suit of the Massachusetts Loan and Trust Company vs. the Citizens' Electric and Power Company, of Houston, United States District Judge Bryant has issued an order postponing the sale of the plant of the Citizens' Electric and Power Company until the first Monday in October, 1900. In the same suit the judge ordered the receiver of the Citizens' Electric and Power Company to institute suit against the city of Houston on the common law docket for $34,344.04, alleged to be due the receiver by the city of Houston for street lights furnished by the receiver to the city.

NEW YORK NOTES.

Mr. EDWARD E. GOUDEY was erroneously made an associate to Mr. Mustard in a recent notice in THE ELECTRICAL AGE. Mr. Goudey has had charge of the foreign department of the Wagner Electric Manufacturing Company since its establishment in New York city. This department was organized last January for the more efficient care of the foreign business of the above company and was formerly carried on in the general office at St. Louis. Mr. Mustard's department is entirely separate from the foreign branch, having the general Eastern agency.

J. S. SPEER, general manager of the Speer Carbon Company, of St. Marys, Pa., called at our offices on July 17th, looking as well as usual. He reports an exceedingly good business in carbon brushes, and states that the demand for special carbons of all kinds exceeds the company's most sanguine expectations. They are now making up some large carbons for electrolytic and electric furnace work. Mr. Speer's ability and knowledge of the requirements for carbons for all applications of electrical work has placed him in the first rank among carbon specialists. The Speer Company's carbon brushes are superior in wear and lubricating qualities to any of either domestic or foreign manufacture, and this fact is conceded by the largest electric railway companies in North America.

W. T. H.



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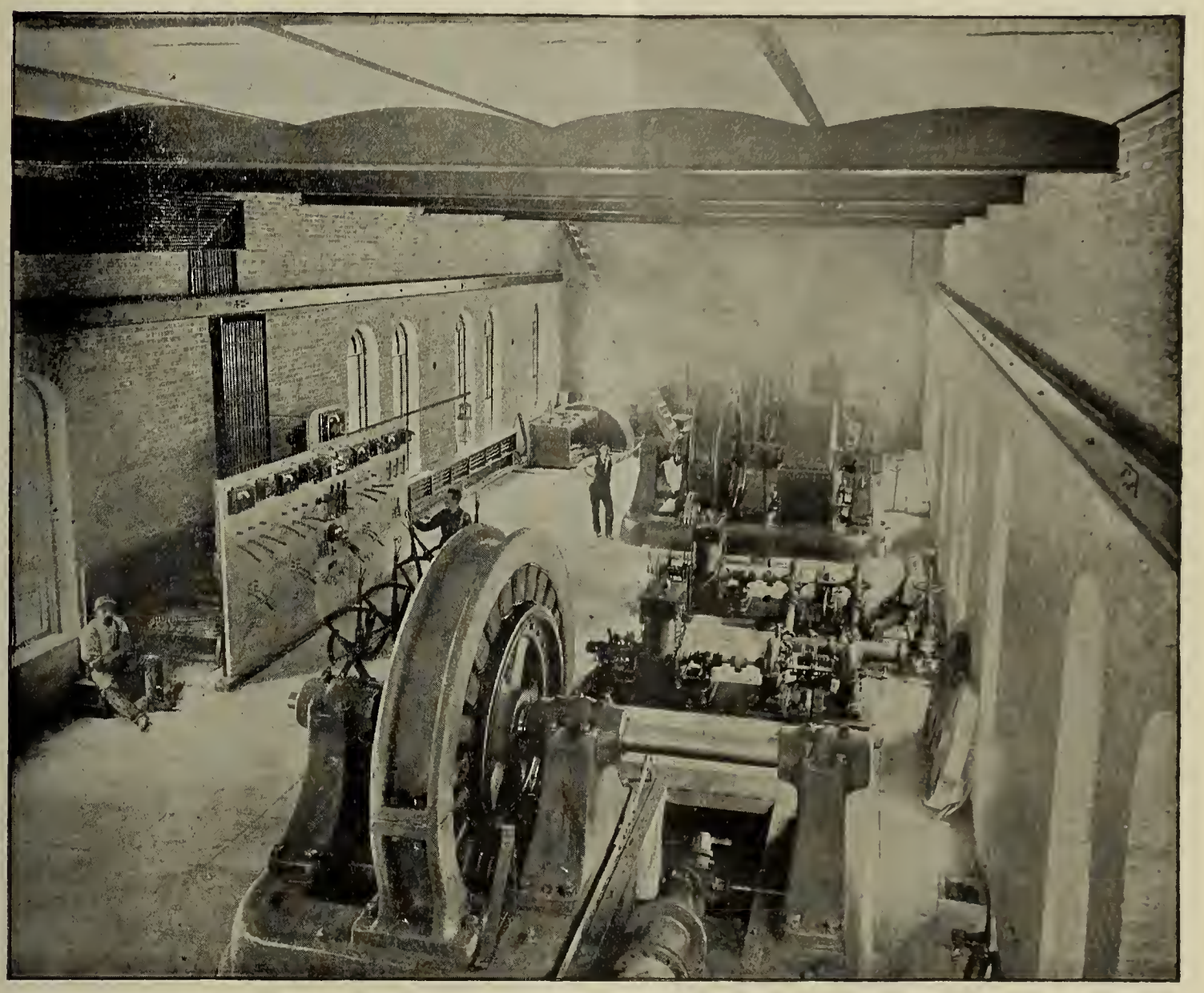
BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.

LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 4. NEW YORK, JULY 28, 1900 Whole No. 689.

Alternating Current Machinery.



Installation of Polyphase Generator.

INSTALLATION OF ALTERNATING CURRENT MACHINES.

Alternators, whether uniphasers or multiphasers, should always be set up in a cool, dry and clean place upon solid foundations. The framework of a belt driven alternator should be insulated whenever possible to do so. This is usually accomplished by tapping the masonry or brick foundation with a varnished wooden base, bolted to the masonry and then bolting the alternator frame to the woodwork by separate bolts. The base on which the frame rests should be carefully levelled and the machine should be set with its shaft and pulley in accurate relation with the driving shaft and pulley.

The commutator should be kept smooth by the application of fine sandpaper at suitable intervals, but this should not be applied until the brushes are lifted. The brushes should be kept in proper shape and condition Their pressure on the commutator surface should receive careful attention. Too much pressure is apt to produce a cutting of the commutator surface and too little pressure is apt to produce sparking. The surface of the commutator may occasionally be lubricated with a small quantity of vaseline applied by a cloth, but never applied by cotton waste.

Should a hot bearing develop heavy oil should at first be copiously applied and the belts slackened as far as may be safely permitted. When a new alternator is started it should be run slowly for some time to see that its bearings are in proper condition and that it operates without undue heating. It is also well to run a recently shipped alternator for a day unexcited so as to thoroughly dry out the armature. When an alternator is started the bearings should always be first examined to see that they have a plentiful supply of oil. When the machine is not running its brushes should be lifted. After starting the brushes are lowered. The machine is then brought up in speed. The exciter circuit is closed and the pressure generated by the machine is then adjusted by the speed rheostat. The load is then thrown on the machine and the commutator brushes are adjusted to the non-sparking position. After the machine is stopped it should be cleansed of oil and dust. Copper dust, if allowed to accumulate, may injure a machine.

HOUSTON & KENNELLY.

Stray Currents.

GASOLENE AUTOMOBILES BARRED FROM FERRY-BOATS.

Supervising Inspector General Dumont, at Washington, D. C., has decided that automobiles whose tanks are filled with naptha, benzine, gasolene, etc., will not be allowed passage on freight or passenger steamships while in that condition. The above ruling therefore bars such vehicles from ferry-boats.

THE SILENT WATCHMAN.

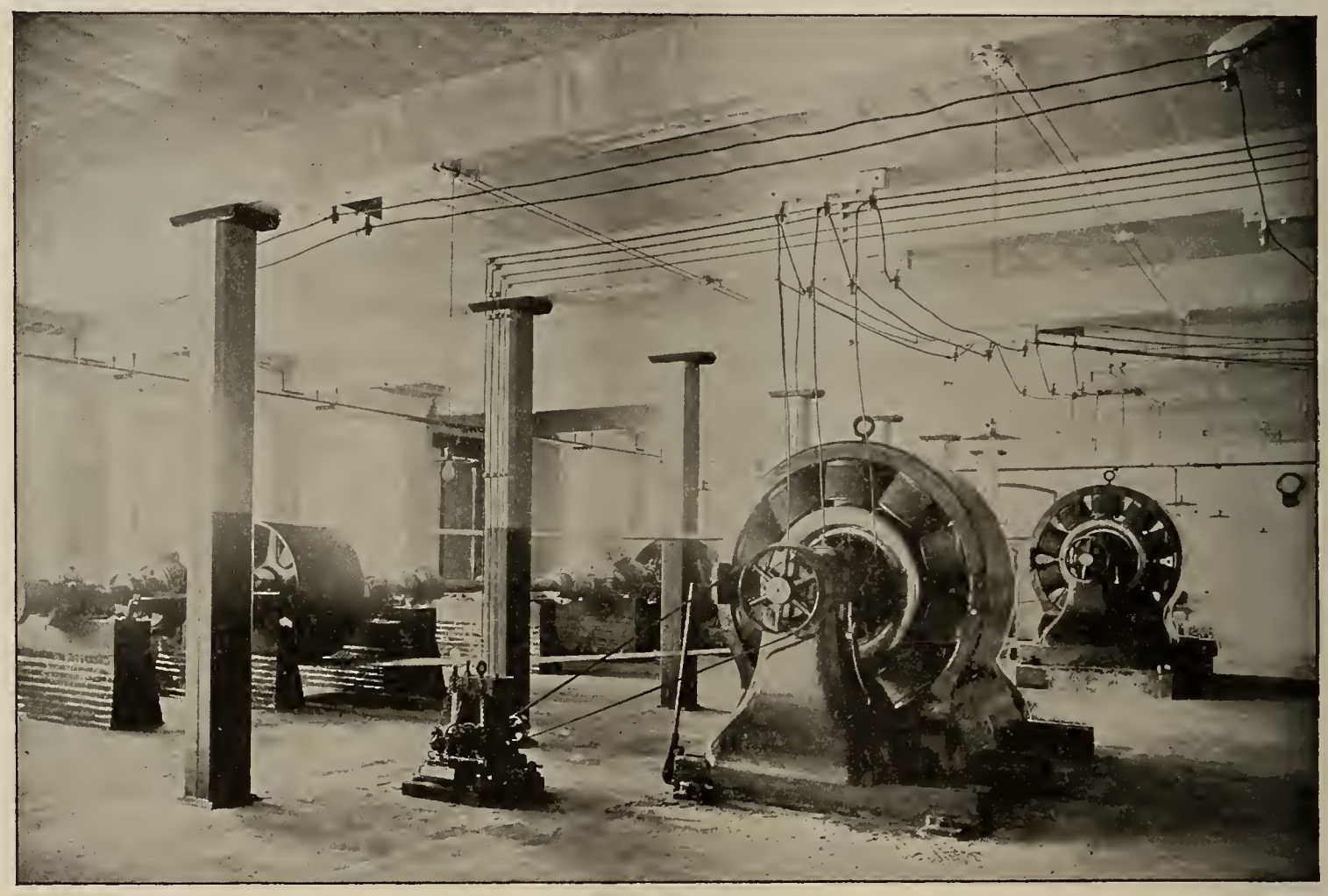
Electricity has been put on guard duty at an American Zoo, and is peculiarly rough on rats and other vermin. A fence of fine wire mesh about 8ft. high surrounds an enclosure in which there is a number of fine game birds. It was found that rats, cats, etc., climbed over this, so that two copper wires were stretched all around the top of the fence about 1 1-2 inch above it and some distance apart. A switchboard was put on the side of an attendant's house, and at dark the watchman turns on the electric current, which is supplied from the electric light wires. The "silent watchman" is said to accomplish remarkable results in killing predatory animals.

TO MAKE OBSERVATIONS OF SUN SPOTS.

The appearance of great spots on the sun has been attended by remarkable auroral displays on earth, telegraphic and other magnetic instruments being at the same time affected, and the auroral activity has been found to coincide with the sun-spot cycle of a little more than 11 years. These facts indicate that the electrical condition of our atmosphere is in some way dependent upon the sun. Though the problem has received much attention, it is still one of the great unsolved mysteries of our planet, and Dr. Paulsen, of Copenhagen, hopes to throw some light upon it by an exhaustive study of the aurora in its home in Iceland. Systematic observations with modern instruments are to be made at the village of Akureyri and on a neighboring mountain, the two stations being connected by telephone.

GERMAN AUTOMOBILE MAIL COACHES.

Consul-General Guenther writes from Frankfort: The "Automobile Company of Speyer," organized last year with a capital of $24,000, has five automobiles in use, representing an investment of about $14,500. They are propelled by a benzine motor, in front of the vehicle, of 10 horse power, and were built by the Daimler Automobile Company, of Cannstadt. Each coach is capable of carrying twenty-eight passengers, and the company has a contract with the post office department to carry the mails (which includes packages, etc., usually sent by express in the United States) to Dudenhofen, Geinsheim, Honhofen, Harthausen, Mechtersheim, Otterstadt and Waldsee—2 to 10 miles away. In the five months since starting, more than 40,000 passengers have been carried.



Installation of Simple Alternator. (See preceding page.)

TELEPHONE IMPROVEMENTS IN GERMANY.

Consul Worman, of Munich, reports: A syndicate has just been formed under the auspices of the Bank of Darmstadt, to bring into practical use certain telephone improvements that have been tested in government offices. These inventions are to make it possible to retain the spoken word and to repeat it as freely as desired; to use the same wire for simultaneous conversation by different parties; to repeat the same conversation at various points; and to strengthen the sounds so as to make the long-distance telephone operate with better results.

Expositions.

NEW YORK STATE BUILDING.

The New York State Building at the Pan-American Exposition, to be held at Buffalo in 1901, is to be an edifice of substantial and enduring character. The architect is Mr. George Cary, of Buffalo. He has chosen for his guidance in the work a Greek temple of the Doric order, adapting his plans to the purposes for which the building is intended. The site chosen is on high ground near Elmwood avenue, overlooking the North Bay of the lake in Delaware Park and near the principal entrance to the Exposition grounds by street cars. The location is not only thus convenient to the electric cars, but one that is fortunate and beautiful as well from every standpoint, so that the building will add to the beauty of this popular pleasure ground. Immediately in front and across the park bay the Albright Art Gallery will stand as a companion piece in the park picture. The building will be used during the Exposition as New York State headquarters, and will contain certain of the State exhibits.

After the Exposition it will become the permanent home of the Buffalo Historical Society, whose large collection of pioneer and other historical relics will be placed therein. The floor area will be three times that now used by the Historical Society in the building of the Buffalo Public Library.

The dimensions of the building are 130x82 feet, the north front to be 20 feet less than the south. The height is 33 feet on the north and 40 feet on the south walls. The height of the basement is 12 feet, and the second floor walls reach to the roof, making the ceiling 18 feet high. In the basement are janitor's quarters and bicycle rooms (which may be entered at grade from Elmwood avenue), boiler and coal rooms, storage rooms, etc. A dining room containing 1,906 square feet faces the park to the south and opens on the north. On the ground floor is also one of the Museum rooms, which communicates with the floor above by a grand staircase. Over 10,000 square feet of floor space is provided for museum purposes. There is also an assembly hall with seats for 300 persons, and a library 37x52 1-2 feet. Offices, cloak and other rooms make the total floor area 31,803 feet. Fire-proof materials will be used throughout in the construction of the building. The exterior will be stone. There will be no wood except the mahogany doors on the first and second floors and birch in the basement. All the door casings, inside column covering and cornices are of plaster. All bases are marble and cement. The floors are marble, concrete, granite and wood blocks laid in asphalt. The stairways are of marble and iron. The view of the bay and lake and of the park, which will be seen from the broad columniated portico on the south side of the building, will be of the most beautiful character.



New York State Building.

THE PARK LAKE.

The beautiful lake here illustrated is about half a mile in length and is within the grounds of the Pan-American Exposition to be held in Buffalo in 1901. The scene is in the most picturesque portion of Delaware Park, which

is considered one of the finest in America. The lake is one of a number of fine water features of the Exposition, and is to be illuminated in a novel way at night by countless electric lights. The wooded slopes and shady walks that surround it are restful retreats, and the quiet lake scene is ever picturesque and refreshing. The picture is taken from a point near the west end of the lake, a few rods northeast of where the broad driveway from the main southern entrance crosses a narrow neck in the lake. A macadam drive follows the bluff along the north side, at the left, and a viaduct over Delaware avenue connects the Meadow Park from the lake section. Upon this portion of the park many thousands of dollars have been expended in improvements. The shrubs and trees include many of the rare decorative species and varieties, and a profusion of flowers is always to be seen along the drives and walks throughout the summer. The main buildings of the Exposition are directly north of this point from which the view is taken.



The lake is to be connected by a series of small cataracts with the grand canal, mirror lakes and lagoons that surround the Exposition buildings.

THE COMING AUTOMOBILE SHOW.

The early applications for space indicate that manufacturers are taking a keen interest in the Automobile Show to be held in the Grand Central Palace from November 14th and 24th. More than ten thousand feet of space has been signed up, and this, with the spaces selected but not yet signed for, will make fully half the available space disposed of almost four months before the exhibition. In location, space and arrangement, the Palace has many good points, while the fact that the automobile show will be open during the horse show week is counted a distinct advantage. The latter has grown to be so important a feature that an average of 50,000 people come out of town to attend each year. The automobile show will appeal strongly to precisely this following, so that these 50,000 out-of-town visitors are not likely to return to their homes without attending the automobile show. The horse show, as heretofore, will be for one week only, the last six days of the automobile show, which will be opened in all ten days. Mr. Marcus Nathan, the general manager of the automobile show, is doing much to stir up an interest that will extend far beyond the present users of automobiles, a fact that should, and, no doubt, will mean much to exhibitors. In addition to extensive and judicial advertising in the newspapers, and by posters, an elaborate plan of circularizing is under way, so that practictlly everybody with money enough to own an automobile will be reached. The representative character of the exhibits and their variety and completeness are factors in creating a popular interest. With this in mind, the management made very low prices, abolished most of the usual extra charges and made all the condtions easy. The result is already apparent in the large advance sale of space to representative concerns.

Ferronite, the material from which a German company is making "hard-rubber nails," has the advantages over metal that it is not attacked by acids and alkalies, does not conduct electricity, and is insensible to magnetic influence. The nails find special applications in the electrical industries. These nails can be driven or used without danger of sparks from friction, and this recommends them also for places where explosives are made or handled.

The Electrical Age.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., } ELECTRIC LIGHT AND POWER.
OSBORNE P. LOOMIS, E. E., }

JOSEPH MUIR, M. D., } ELECTRO-
FREDERICK STRANGE KOLLE, M. D., } THERAPEUTICS.

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THE MANUFACTURER'S PERIL.

If it is true that competition is the spirit of business, is it not also true that unless limitations are imposed upon such competition by the mutual consent of manufacturers that it is more apt to be an evil sprit, reaping not a crop of successes, but a crop of failures; producing not the busy hum of factory life but the empty, neglected and silent ruins of deserted factories? If the secret of success were but a little thing that lies within the power of all men to know its value would not be lessened. Greater knowledge in this respect simply leads to keener competition and a more gigantic struggle in which the intelligence and specific gravity of each will be the only indication of possible success. The pressure under which business is transacted is greater in many cases than the physical force at the command of man can endure. But in spite of such pressure the field is well occupied and the manufacturer competes with his neighbors with or without cause.

In the United States the development of industries is much more rapid than in any other country on the face of the globe. This is particularly true with manufacturers and it naturally gives rise to questions relating to them, generally and specifically. In other respects the pressure an industry exerts upon those engaged in it as proprietors is destructive in its effects. Why are manufacturers such close competitors? Do expenses tread close on the heels of gross receipts? Is the desire to do business so great that orders are taken to an extent that overburdens the capacity of the plant? Or is the season so fluctuating that profits must be made in the very shortest of intervals? Those reviewing the situation among electrical manufacturers have much to complain of.

A writer for an organ representing the National Association of Manufacturers of the United States and member of the same body says: "The manufacturing business is something like a street car with always room for one more, and it is very hard for a manufacturer to resist the temptation to book another order when he knows that his order-book is rather full, because there is always room to crowd his machinery and turn out a little more product. Therefore, manufacturers become careless in this way and rarely look to see when they are full of orders but give their whole thoughts to getting all they can, feeling sure of their ability generally to turn out more goods than they can sell."

This is where the real peril appears. Delay in shipment will follow; possibly the rescinding of orders: the loss of customers and the loss of their respect for you; possible law suits and, on the whole, a variety of disagreeable circumstances, each and all the outcome of a destructive competition. The pressure is certainly too great for business to be done in a healthy, conservative and dignified manner. Greed for orders, jealousy of competitors and lack of proper working capital conspire to make the manufacturer's life a series of perpetual torments; in truth, a new chapter for a modernized edition of Dante's "Inferno."

SMOKE CONSUMPTION AND HEAT WASTE.

In 1898 the coal fields of Pennsylvania produced two hundred millions dollars worth of fuel, consumed during the year in various parts of the United States and representing within a few per cent. all of the coal utilized for domestic and industrial purposes. Of this vast quantity of coal about thirty million dollars' worth was effectively consumed and its energy utilized; the balance, amounting to over one hundred and seventy million dollars worth, was wasted in two ways. First, as smoke; second, as radiated heat.

The first difficulty has been wrestled with by the industrial economists of Germany. A process, patented by Mr. Paul Cornelius, is of such a character that low grades of fuel are consumed in toto, smoke and all. Hot air is injected between the bars under pressure and a combustion thereby secured of a most complete and satisfactory nature. The advantage of burning the smoke is doubtless great from an hygienic point of view, but one that would be the means of saving more of the heat would undoubtedly add so greatly to the cheapness of electric power that it would unquestionably become a cheap and indispensable element in all homes. With an abundance of fuel, and boilers constructed according to the latest and best scientific principles the price of power has at present reached its lowest terms, but in spite of all that science and invention has done in the field of thermo-dynamics the tremendous waste taking place daily, monthly and yearly invites the most serious consideration from those interested in the problems of the day.

Were our reservoirs to overflow and cause an annual destruction of property amounting to one hundred million dollars a great cry would be heard all

over the land. Were a hundred million dollar slice of American territory seized each year by foreign powers indignation would rise to such a pitch that war would be inevitable. Yet with millions of tons of coal disappearing each year and a certain percentage of this country's future passing away with it without an adequate return the national voice is still and little or no notice is taken by other than scientific men of this steady loss of national vitality. Take away the coal fields of America and only a huge agricultural district would be left; manufacturing would cease and the comforts of civilization be procured at an expenditure far exceeding their proper value.

England will soon be without fuel and all of Europe, with the exception of Russia, will turn to America for coal. The rate of consumption will then be doubled or quadrupled and the seemingly inexhaustible coal fields will melt literally into thin air. The time is certainly at hand for a radical change in our methods of consuming coal.

A SMALL ELECTRIC FAN.

The small electric fan has come into vogue and is generally found by the bedside of more or less humble city residents, and its tiny breeze brings great comfort in the watch hours of the night. They are generally found operating from a battery which, in spite of our scientific knowledge, has not changed perceptibly in construction in the last half century. The motor has, in the sense that it is cheaper and better adapted to the purpose in view each year, but it seems as though a source of small power in the form of electricity, cheap to generate and convenient enough to handle, would mean a golden harvest to the inventor, but with zinc that dissolves in sulphuric acid we have the same old question over again. There are one million people waiting for cheap domestic electricity and someone should supply it.

Literary.

A FINE LITTLE BOOK.

One of the prettiest of the many beautiful books printed by the railroads to give their patrons information regarding summer resorts, the way to reach them and the time and money it takes to do so, is No. 8 of the New York Central's "Four-Track Series" entitled "Two to Fifteen Days' Pleasure Tours." It contains a great number of illustrations of delightful summer places, the details of dozens of trips ranging from two to fifteen days, and explaining how they may be extended for the whole season, with small explanatory maps giving just the information the inquirer wants, and in a compact table the time and rates of fare to one hundred and thirty popular resorts with two maps 8x16 printed in colors. Any person contemplating a trip will find No. 8 of the Four-Track Series a valuable reference book. It will be sent free, post paid, to any address on receipt of a postage stamp, by George H. Daniels, General Passenger Agent, New York Central & Hudson River Railroad, Grand Central Station, New York.

NEW SCHOOL OF PRACTICAL AGRICULTURE AND HORTICULTURE.

There has been established at Briarcliff Manor on the Putnam Division of the New York Central, twenty-seven miles out of New York, the first school of argriculture and horticulture established in this country.

The object of the school is the practical training of men and women in correct methods of horticulture, floriculture, gardening, poultry keeping and allied branches, that they may become proficient in the management of farms, estates, greenhouses and gardens, and may be able by thorough knowledge of the science of the soil to make the field, through intelligent and skillful work, bring forth abundantly of its great wealth of beauty and usefulness. The aim will be to raise the standard of agricultural methods and to demonstrate, through practical instruction, the higher value that may be obtained from land under more intelligent management.

The course of study will include horticulture, botany, chemistry, geology, economic entomology, building construction, stock husbandry and book-keeping.

The school board of trustees comprises such names as Hon. Abram S. Hewitt, R. Fulton Cutting, Hon. W. E. Dodge, Theodore Havemeyer, Van Rensselaer Townsend, Wm. J. Schieffelin, Hon. John G. Carlisle and others. Mr. George T. Powell is director.

The school will be opened September 12th of this year, and it is expected it will have more than its full complement of students. The school may also be reached via the Harlem Division of the New York Central from Pleasantville station, and its near location to the New York Botanical Gardens at Bronx Park, on the Harlem Division, will afford special advantages to students.

Educational.

COOPER UNION FOR THE ADVANCEMENT OF SCIENCE AND ART. FREE DAY SCHOOL.

The Cooper Union free day school for instruction in technical science will be opened October 1st. The course of instruction is designed especially to supplement the complete scientific course of the high schools of New York City, thus offering to the graduates of these schools who intend to engage in engineering work of any kind facilities for studying practically the line of work adopted. Laboratories are already equipped. Instruction will be given by lectures, recitations and practical work at the laboratory tables. The various branches of engineering work for which provision is here made are mechanical engineering electrical engineering and civil engineering. The complete course will requuire three years of study. For the first year the work of all students will be substantially the same, but will at the beginning of the second year be designed especially to meet the requirements of the three several kinds of engineering work. No examination for admission to either course will be required of applicants who bring certificates showing that they have completed the required course of mathematics of the high schools of New York City. Certificates from other schools and academies will also be accepted. The hours for lectures and recitations will be between 9 A. M. and 3 P. M. For certain kinds of laboratory work or out-door surveying the above period will be extended. The hours of the lectures as well as the time of the recitations and laboratory work will be definitely stated in a programme yet to be published. It is assumed that each student taking the regular course will be engaged in some class exercise from two to three hours a day. The school year begins October 1st and ends about May 15th. The trustees have also made provision for certain special students, who, being engaged in some technical work, desire aid and instruction in their own specialties exclusively. It is probable that the chemical and electrical laboratories will most frequently afford the desired facilities. There are no fees for tuition in any department. The student is required to buy the text books necessary for class instruction, and to pay for chemicals used by him in the laboratory. Application blanks may be obtained by personal application at the office of the Cooper Union, or by letter addressed to the Assistant Secretary. A programme of exercises will be published in September.

Obituary.

JOHN ABENDROTH.

John Abendroth, a member of the well-known firm of Abendroth & Root, manufacturers of the famous Root water-tube boilers, died at White Plains, N. Y., July 23d, aged seventy-six. He leaves a wife, a son and two daughters. Mr. Abendroth was formerly connected with the firm of Abendroth Brothers, iron founders at Port Chester, N. Y., and was well known in mechanical and electrical circles.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED JULY 10, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

653,218. Motor controller. D. H. Darrin, Cranford, N. J.

653,221. Electric traction balloon. M. J. A. Deydier, Lyons, France.

653,241. Advertising device. D. W. Hogan, Medford, Mass.

653,319. Supervisory and busy-test appliance for telephone lines. C. E. Scribner, Chicago, Ill.

653,342. Diamagnetic separation. Elmer Gates, Chevy Chase, Md.

653,343. Electrostatic separation. Elmer Gates, Chevy Chase, Md.

653,344. Diamagnetic separation. Elmer Gates, Chevy Chase, Md.

653,345. Diamagnetic separation. E. Gates, Chevy Chase, Md.

653,346. Magnetic separation. E. Gates, Chevy Chase, Md.

653,422. Telephone-test set. A. C. Ludington, Marquette, Mich.

653,424. Speed-equalizing device. A. D. Lunt, Schenectady, N. Y.

653,448. Reel or spool for electric thermostatic cables. J. D. Gould, New York, N. Y.

653,459. Automatic hotel call-bell. G. B. Reaben, Summit, Miss.

653,469. Electric signaling apparatus. H. G. Carleton, New York, N. Y.

653,470. Self-starter for electric motors. H. H. Cutler, Chicago, Ill.

653,471. Controller for dynamo-electric machines. H. H. Cutler, Chicago, Ill.

653,472. Controller for dynamo-electric machines. H. H. Cutler, Milwaukee, Wis.

653,530. Voltaic cell. C. T. Richmond, Cleveland, Ohio.

653,538. Electrolytic apparatus. N. L. Turner, Salmon City, Idaho.

653,554. Circuit-controller for incandescent lamps and magnetic guide therefor. M. W. Hanks, Pittsburgh, Pa.

653,572. Electric arc lamp. J. A. Fleming, London, England.

653,577. Thermo-electric light cup. C. R. LaBier, Terre Haute, Ind.

653,585. Contact brush. S. L. Neely, Pierron, Ill.

653,590. Primary battery. E. R. Post, Newburg, N. Y.

Business News.

SHOULD HAVE AGENTS IN SWEDEN.

In order to secure a share of the available trade in Stockholm, Sweden, for coal and ore conveying machinery, and, in fact, all kinds of labor-saving tools, especially for hoisting purposes, for mining and for electricity, it is necessary for American manufacturers to have agents there, at least so writes a Mr. Aug. Dahlstrond, No. 3 Gotgatan, Stockholm, to parties here. The same party claims that agents are also needed to sell coal, rails, rolled beams, etc. The opportunities for trade developments in Sweden are vast, and the United States, of all the industrial countries, is doing the least to capture a share of the business.—N. Y. Journal of Commerce.

COMING TO PURCHASE MACHINERY.

Mr. W. J. Mathieson, a commissioner of steam railways from the Government of Victoria, Australia, with several other officials, is expected in this country shortly. The object of their visit, it is stated, is for the purpose of placing orders for public undertakings. It is estimated that these orders will include a quantity of machinery, supples, etc. In about a month the exact purchases to be made by these gentlemen will be known. It is said that the expenditures will reach all of $1,000,000.—Ex.

CRUCIBLE STEEL COMPANY.

The Crucible Steel Company of America has been incorporated under the laws of New Jersey with a capital stock of $50,000,000. Half of this is common stock and the remaining half preferred. The plants included in the combine make fully 95 per cent. of the crucible steel produced in the country and are as follows:

Park Steel Company, Pittsburg.

Howe, Brown & Co., Pittsburg.

Anderson, DuPuy & Co., plant located at McKee's Rocks, Pa.

Aliquippa Steel Company, plant located at Aliquippa, Pa.

Singer, Nimick & Co., Pittsburg.

Crescent Steel Company, Pittsburg, Pa.

La Belle Steel Company, Pittsburg.

Benj. Atha & Illingworth Company, Newark, N. J.

Sanderson Bros. Steel Company, Syracuse, N. Y.

Spaulding & Jennings Company, Jersey City, N. J.

Steel Department of Cumberland Steel and Tin Plate Company, Cumberland, Md.

Beaver Falls Steel Works, Beaver Falls, Pa.

Burgess Steel and Iron Works, Portsmouth, Ohio.

The directors of the company are as follows: William G. Park, Reuben Miller, James W. Brown, Herbert DuPuy, Frank B. Smith, Benjamin Atha, G. Bruce Harton, R. E. Jennings, C. H. Holcomb, J. M. May, H. H. Dickey, James H. Park, A. W. Black, L. D. York.—Ex.

NEW INCORPORATIONS.

Jersey City, N. J.—The Central Electric Light Company, recently organized to gather in all the electric light companies in Central New Jersey, has absorbed the electric light companies of New Brunswick, Perth Amboy, Rahway, Metuchen and Bound Brook.

Columbus, Ohio.—The Ernes-Hopkins Company, of Columbus, has been incorporated for manufacturing electrical supplies. Capital, $10,000; incorporators: J. A. Ernes, W. A. Hopkins, Jr., F. R. Huntington, T M. Livesay

Smith's Falls, Ont.—The Citizens' Electric Company, Limited, of Smith's Falls, has been incorporated with $35,000 capital Mr. J. H. Gould is president and Mr. J. S. Gould secretary. The works are being enlarged.

New York City.—The Seaside Electric Light, Heat and Power Company was recently incorporated. Capital, $5,000; directors: William Wainwright, Mrs. Sarah Tator, John Remsen, W. G. Wainwright and John W. Wainwright, New York City.

Peekskill, N. Y.—The Peekskill Lighting Company has been formed to manufacture electricity and gas for light, heat and power purposes. Capital, $50,000; directors: Benjamin B. Nostrand, Jr., Peekskill; H. Hobart Porter, Jr., and Francis Blossom, New York City.

Trenton, N.J.—The Arnold Monophase Electric Company, of Trenton, has been chartered for the distribution of electricity. Capital, $500,000; incorporators: C. T. Eggleston, of Philadelphia; F. B. Lee, N. L. Petty, both of Trenton; F. B. Lee, attorney, Trenton.

Wilmington, Del.—The International Light, Heat and Power Company, of Wilmington, has been incorporated for manufacturing light, heat and power. Capital, $500,000; incorporators: O. B. Thatcher, of Palmyra, N. J.; G. Ford, W. M. Patton, D. M. Rattay, W. M. Pyle, all of Philadelphia, Pa.

Cortland, N. Y.—The Croton Electric Light and Power Company, of the town of Cortland, Westchester County, has been chartered with a capital of $10,000; directors: James Murray Mitchell, Robert P. Barry and Armitage Mathews, New York City; Henry M. Haviland, Brooklyn, and Joseph R. Swain, Sing Sing.

Trenton, N. J.—The St. Lawrence Gas, Electric and Transportation Company has been incorporated with $400,000 capital stock. The company is a consolidation of all the gas, electric and traction companies of St. Lawrence County, and it is understood that P. A. B. Widener and W. L. Elkins, of Philadelphia, are interested in the deal.

Lexington, O. T.—The Purcell Electric Company, with its main office at Lexington, O. T., and a branch office at Purcell, I. T., has been chartered. The company proposes to supply both places with electric light and power, a telephone system and an ice manufacturing and cold-storage plant. The time of the charter is for twenty years and the capital stock is $20,000. The following are the directors: L. G. Wantland, Purcell; O. J. Nichols, Purcell; W. G. Blanchard, Purcell; R. B. Stichter, Purcell; S. C. Hawk, Lexington; Neal Smith, Lexington.

TELEPHONE CALLS.

Hartford City, Ind.—The Indiana Telephone Company, of Hartford City, has been incorporated with a capital stock of $50,000; directors: William B. Cooley, A. G. Lupton and Harry O. Miller.

Attica, Ohio.—The Attica Telephone Company, of Attica, has been incorporated to build and operate a telephone line. Capital, $2,500; incorporators: F. C. Myer, J. Schattler, R. T. Hearson, H. G. Blain, E. G. Blain.

Omaha, Neb.—The Nebraska Telephone Company has filed amended articles of incorporation in the county clerk's office increasing the capital stock from $1,000,000 to $2,000,000. An official of the company said that there was no significance to the increase except to provide for extensions which it may be deemed advisable to make.

Trenton, N.J.—The National Telephone & Telegraph Company has been incorporated with a capital stock of $50,000,000. The incorporators are Joseph B. McCall, A. Louden Snowden, Harry J. Verner and James F. Sullivan, of Philadelphia, and Huelings Lippincott, of Camden. The company is authorized by its charter to "construct, maintain and operate electric telephone and cable lines within and across the Hudson River in connection with lines in New York now or to be established and thence with lines in other States and Territories, colonies and foreign countries," and to operate a system of telegraph with or without wires.

ELECTRIC RAILWAYS.

San Francisco, Cal.—A franchise has been granted by the Shasta County (California) Supervisors to the McCloud River Electrical Power Company. The company intends putting a railway between Redding and Copper City, a distance of thirty miles, and expects to have it in operation within a year.

Shelbyville, Ill.—The Secretary of State has licensed the incorporation of the Hervey City & Southern Electric Railroad Company. The company plans the construction of an electric road from Hervey City to Shelbyville. The capital stock of the corporation is to be $150,000. The principal office of the road is to be located at Macon. The incorporators and members of the first board of directors are: J. Smith Butrum, Decatur; Robert B. Hennigh, Prairie Home; Robert H. Woodward, Harold R. Woodcock and John M. Turner, of Macon.

POSSIBLE INSTALLATIONS.

Wellington, Kans.—The city will install and operate a municipal electric lighting plant. Machinery and apparatus for 50 arc and 1,000 incandescent lights will be required.

Portland, Orgeon.—A large electric light plant will be put in at the Cornucopia mines, in Union County, Oregon. The waters of Pine Creek will be utilized to operate the machinery. Work on the plant will begin immediately.

AUTOMOBILES.

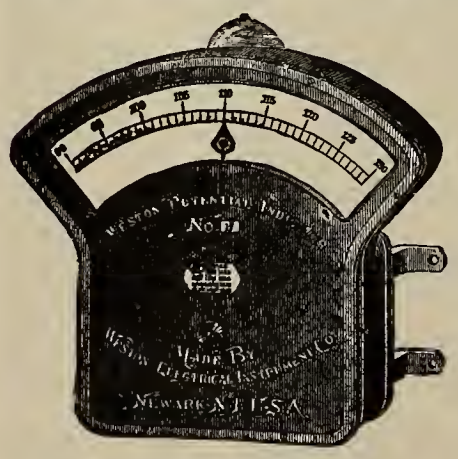
Martinsburg, W. Va.—The National Automobile Company has been formed to manufacture automobiles. Incorporators: G. McGill, H. Wells, E. Sampson, J. Fisher, F. Turner, all of Martinsburg; capital, $1,500,000.

THE STORAGE BATTERY.

New York City.—The Auto-Storage Battery Company has been incorporated in West Virginia to do a general storage battery business. Incorporators: W. B. Smith, F. H. McCoun, C. O'Shaughnessy, J. Lee, L. J. McCormack, all of New York City; capital, $5,000,000.

WESTON STANDARD ILLUMINATED DIAL

STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

114-120 William St., Newark, N. J., U. S. A.

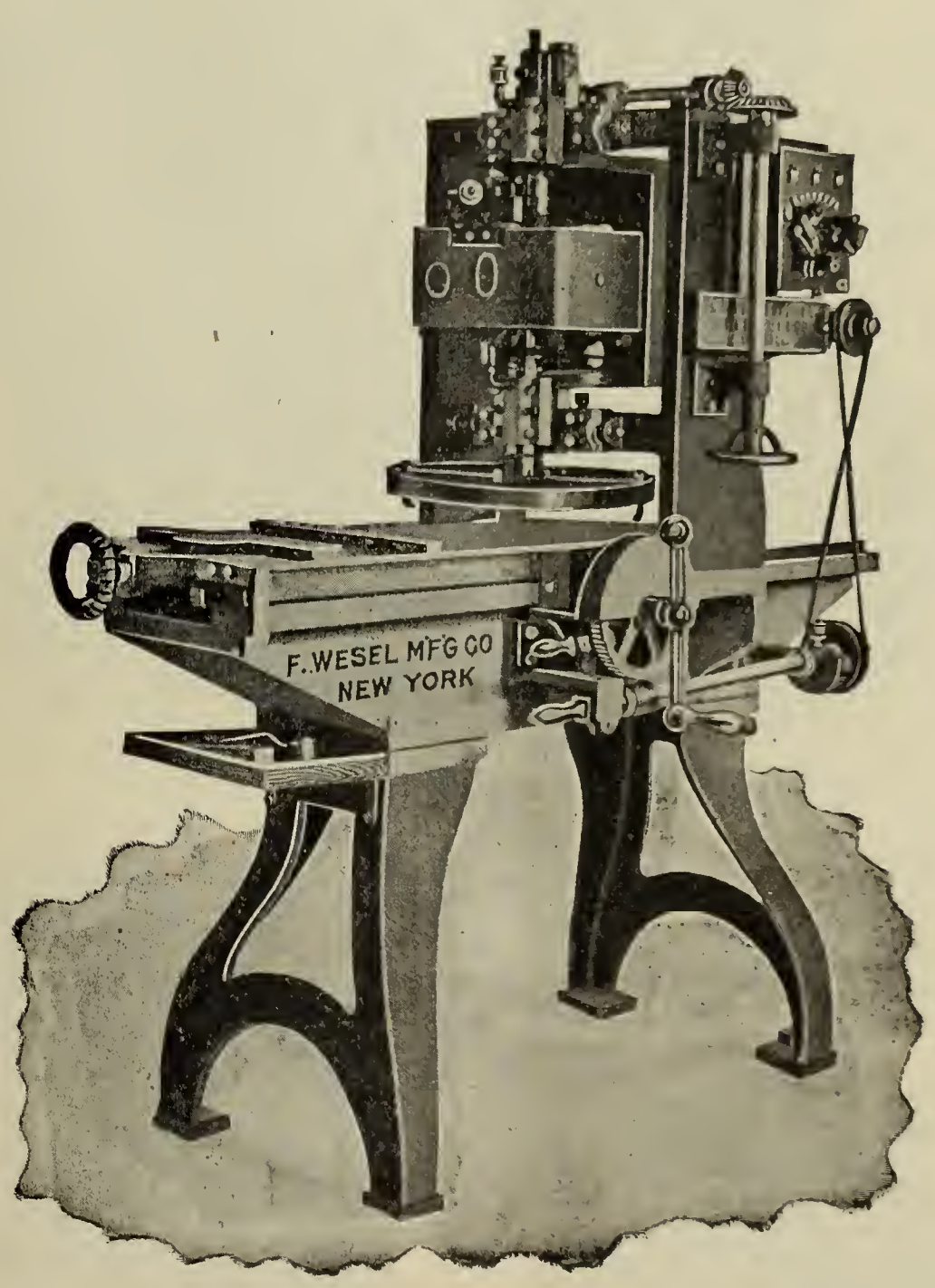
BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.

LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 5. NEW YORK, AUGUST 4, 1900 Whole No. 690.

The Application of Direct Connected Machinery.



Daniels Planer for Wood and Metal. Motor on Main Shaft.

ELECTRICITY AND THE ART OF PRINTING.

In the good old days of Guttenberg the art of printing was established upon certain conservative lines which allowed of no progress, in spite of the mass of literature turned out, until within a century ago. In order to improve upon the methods of printing it was necessary to develop the machines performing that function and in addition to invent type, the ready handling of which allowed of changes and corrections without an undue waste of time. At present through the aid of the linotype, stereotyping processes and huge presses of the most expensive character, fine printing is done in the wink of an eye, as it were. The speed with which high quality printing is done, as well as the grade of work turned out, depends entirely upon the class of machinery employed.

In this age, in which the maximum of mechanical perfection seems to be reached in all industries, we are supplied with ultra-senses; a fineness, for instance, in touch

of an unrivalled delicacy; a power of sight magnifying objects thousands of times beyond their natural size; a range of vision reaching to the stars and an ability to exercise tremendous forces at a minimum of effort. In the same manner, through the aid of these natural principles which crystallize as useful and practical machines, the various processes involved in the art of printing are rapidly and faithfully executed. Through the application of electricity electrotyping, stereotyping and photo-engraving machinery have reached a point of high excellence which raises the art of printing and the facility with which it is performed to the highest point of success.

In the illustrations are shown some few of the machines indirectly referred to above. The power wax shaving machine, for instance, invaluable for shaving the wax surface of cases for moulding half-tone work. Also the improved backing-up press, driven by electricity, with backing cams, blower and overhead lifting arrangement. By the aid of this machine the built-up parts of the copper shells of electrotypes are prevented from being forced down and a uniform pressure is otherwise ap-

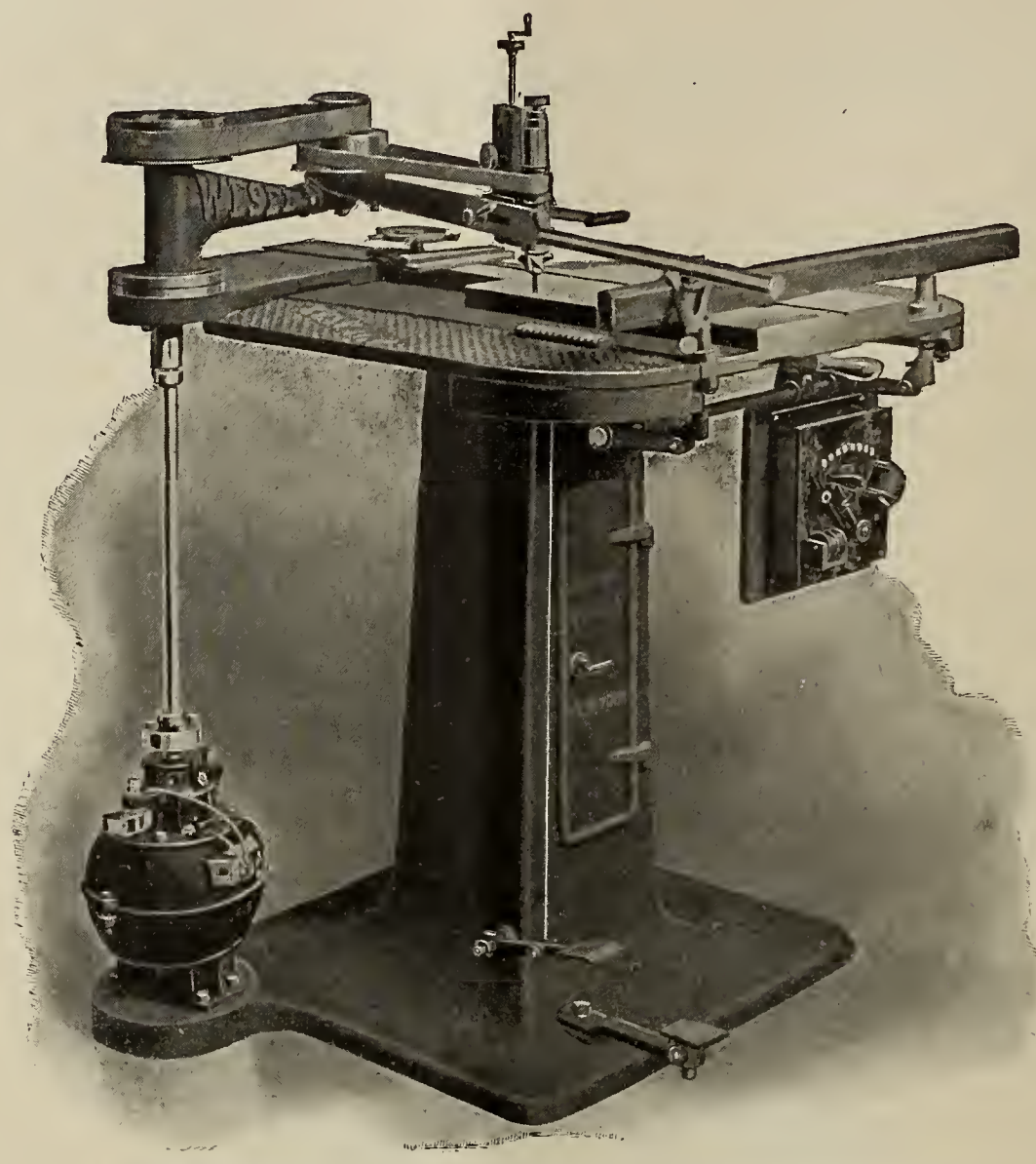
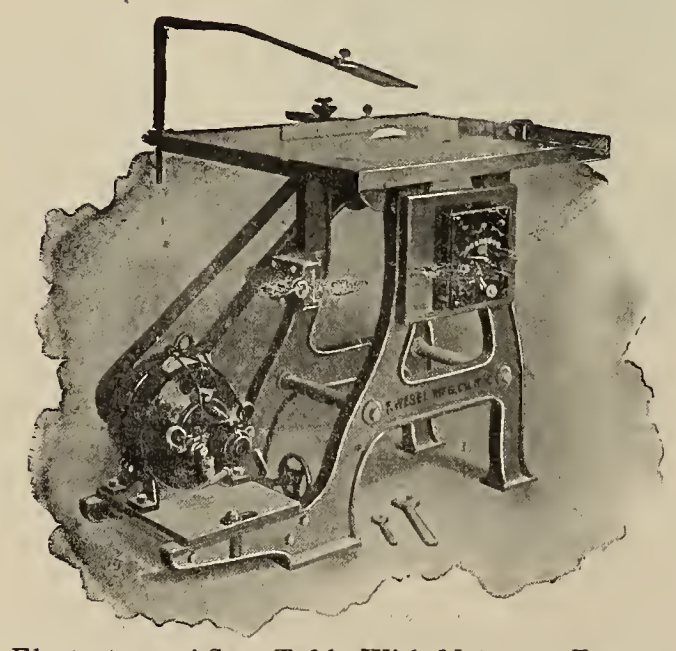
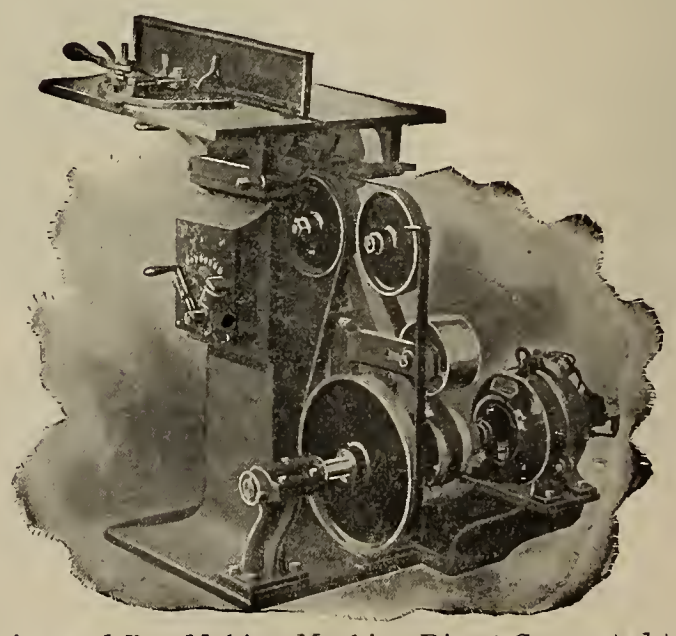


Photo-Engravers' Routing Machine With Motor on Driving Shaft.



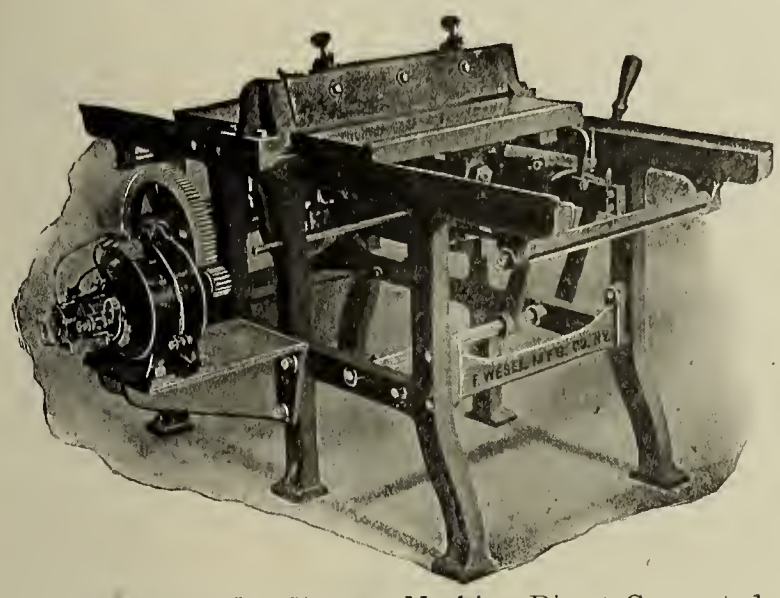
Electrotypers' Saw Table With Motor on Frame.



Tenoning and Box-Making Machine Direct Connected to Motor,

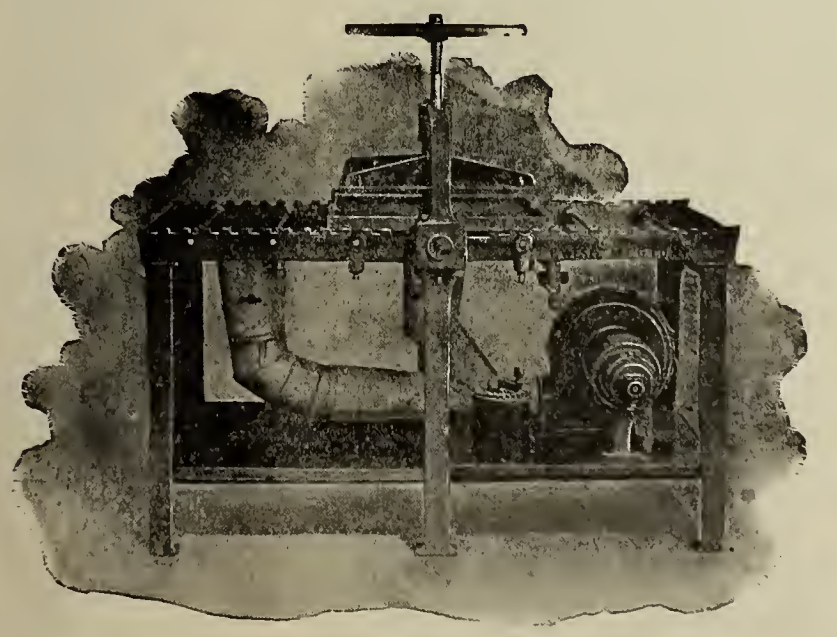
plied. In driving the saw-table the motor finds a commoner application. This table is used for limiting the height of the saw cut and finishing off the block on which the electrotype is tacked. The routing machine, driven by electricity, represents a novelty as far as this new application is concerned. By means of this machine, which is the offspring directly of electrical electrotyping processes, zinc, copper and electrotype plates can be quickly and accurately routed. The routing can be carried on as high as the type itself.

The trimming machine employed in electrotyping



Electrotypers' Wax Shaving Machine Direct Connected to Motor.

work is used for squaring up the sides of electrotype, zinc and copper plates, mounted on wood or metal. It has proven a great aid to the art of electrotyping and is an indispensable article of use. The Daniels planer, driven by electricity, as shown, is used for the purpose of planing the lumber true and smooth and to any thickness required. The table on which the board to be planed is placed does not respond to any elastic influ-



Electrotypers' Backing-Up Press With Motor Direct Connected to Blower.

ence, thereby unevenness is avoided in the blocks on which the electrotype plates are mounted. A most interesting machine is the tenoning and box making machine. By the use of this press-boards, panel or batten blocks for electrotypes plates, etc., can be readily dovetailed in the strongest manner and in making plate boxes all work can be done necessary to cut and fit the pieces.

These direct driven machines are supplied to the trade by the F. Wesel Manufacturing Company, with factory at 78-80 Cranberry street, Brooklyn, N. Y., and office and warerooms 82-84 Fulton street, New York city.

Miscellaneous.

STRAY CURRENTS.

INFLUENCE OF ELECTRIC LIGHT UPON HORTICULTURE.

The method of horticulture under the influence of electric light has made such advances that the growing of lettuce for salads, in spacious greenhouses, with the aid of electric light, is already carried on as a profitable industrial pursuit. The use of electric currents for stimulating vegetation still remains unsettled. With what is now known of the influence of micro-organisms upon vegetation, further research on similar lines is most desirable and very promising.

TERRIFIC SPEED ATTAINED BY AN AUTOMOBILE.

W. K. Vanderbilt, Jr., is reported to have made a trip to Boston and back from Newport on his French automobile at an average running speed of over 3 miles an hour. At any rate, he went fast enough so that he was arrested at Milton, Mass., and detained until he could pay his fine.—Western Electrician.

Is Mr. Vanderbilt trying for a new record?

ELECTROLYTIC EXTRACTION OF ZINC.

An invention for the electrolytic extraction of zinc is due to C. Hoepfner. It consists in electrolysing a solution containing zinc, and capable of dissolving lead or copper, using a lead or copper anode. The anode and the cathode are separated by a diaphragm, and zinc is precipitated at the cathode in proportion as the anode dissolves. Finally the electrolyte is precipitated with calamine-ore (carbonate of zinc), which throws down the copper or lead in solution and provides a fresh solution of zinc for electrolysis.

ELECTRIC LIGHT VS. GAS.

After an investigation into the effect upon the eyesight of the incandescent electric and the incandescent gas lamp, the University of Heidelberg has decided that neither light, if properly placed, has any bad effect upon the eyes. On the question of lighting, the committee in charge decided that for the lighting of rooms, especially concert rooms and lecture halls, where many people remain for long periods at a time, the electric light is without doubt to be preferred to all others from a hygienic point of view.

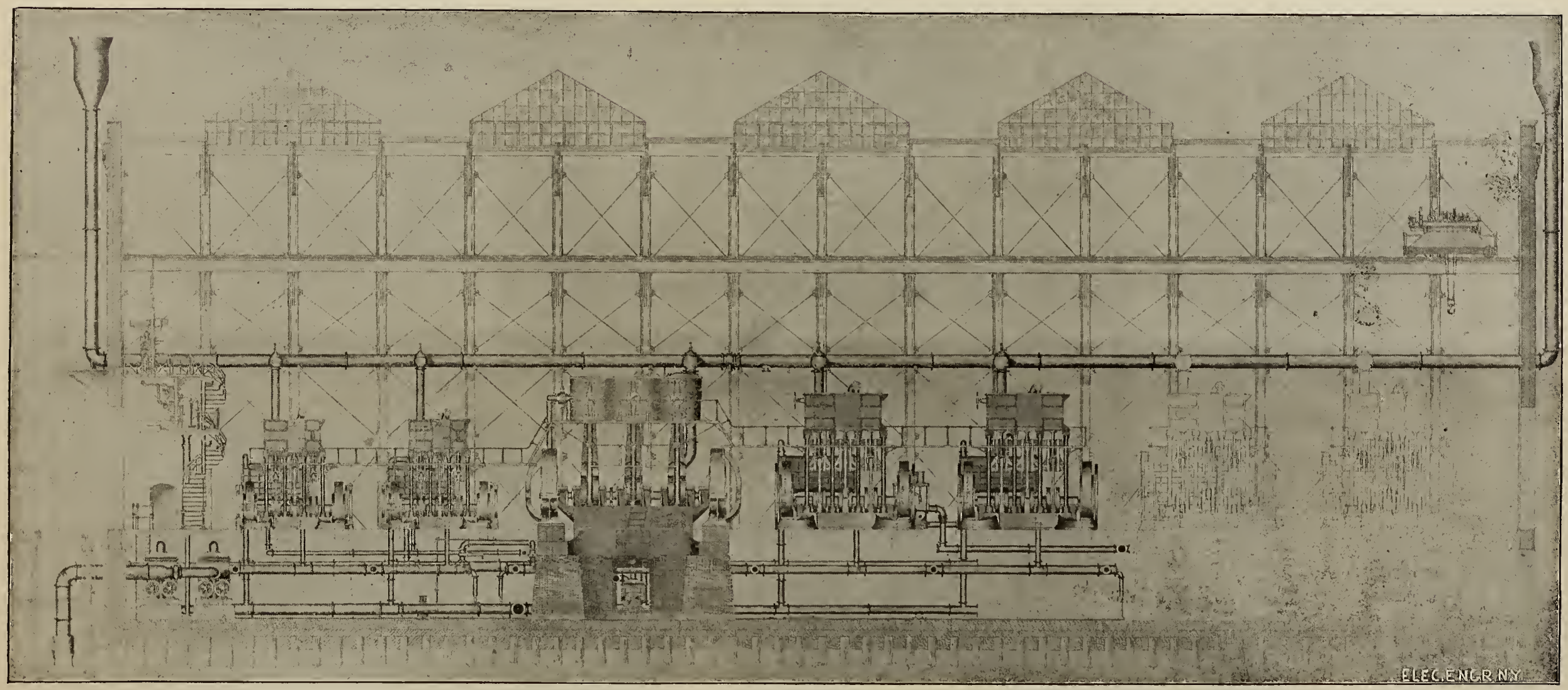
ELECTRIC POWER WANTED IN GREECE.

Consul McGinley writes from Athens: From reliable sources, I have learned that the Athens and Piraeus Railway Company must, according to condition in its franchise, adopt electricity as the motive power for its trains within the next three years. This road extends from the quay in Piraeus to the business center of Athens, some 5 miles, three-fourths of a mile of the distance being through a tunnel under a portion of the city. A Belgian company which owns and operates a steam tramway between Athens and Piraeus, via Phaleron, also wishes to adopt electric power for its trains; but how soon it desires to make the change has not been learned. Each road has a very large passenger traffic, especially in the summer. A company of Athens has been trying to secure the contracts for fitting these roads with electric power. I have been informed that the president of the first named company has gone to the exposition at Paris to examine the electric contrivances on exhibition there and to endeavor to secure the best possible power for his road.

Modern Central Station Practise.

STEAM APPLIANCES FOR ELECTRIC LIGHTING.

The earning power of an electric light station is largely dependent upon the perfection and, incidentally, the efficiency of its steam apparatus. Taking a general view of the case it may be said that an electric light station is one in which coal is burnt and electricity produced and sold. While the amount of electricity sold may not vary to any great extent it is evident that as the coal consumed governs the original cost of this form of energy that in itself must be limited in its consumption in order to obtain that element of profit necessary for the success of any business venture. On account of this fact modern electric light stations are supplied with the best of boilers, feed water heaters, condensers, oil separators., etc. The collective effect of using improved machinery of this description is most noticeable at the end of the year when the total cost of operation is balanced up against the total income from the sale of current.



Steam Appliances for Electric Lighting.—Cross Section of a Modern Electric Light and Power Plant.

In these sketches are shown views of the various pieces of apparatus employed in the purely mechanical section of an electric light plant. The feed water heating apparatus and the condensers cut an important figure

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ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.
JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

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THE STEAM TURBINE FOR ELECTRIC LIGHTING.

The most highly developed type of steam engine is undoubtedly the steam turbine, crystallized in its present form by Parsons and De La Valle. The Curtis steam turbine, now under consideration by one of the largest electric corporations in America, also possesses features of unusual interest as regards structure and efficiency. It seems as though the steam turbine were fated to play an important part in the industrial and naval development of the United States. Its adaptability on board ship as the prime source of motive power and its usefulness on land for the driving of dynamos with a high attendant efficiency gives it many advantages over the reciprocating, single cylinder, compound or triple expansion engine.

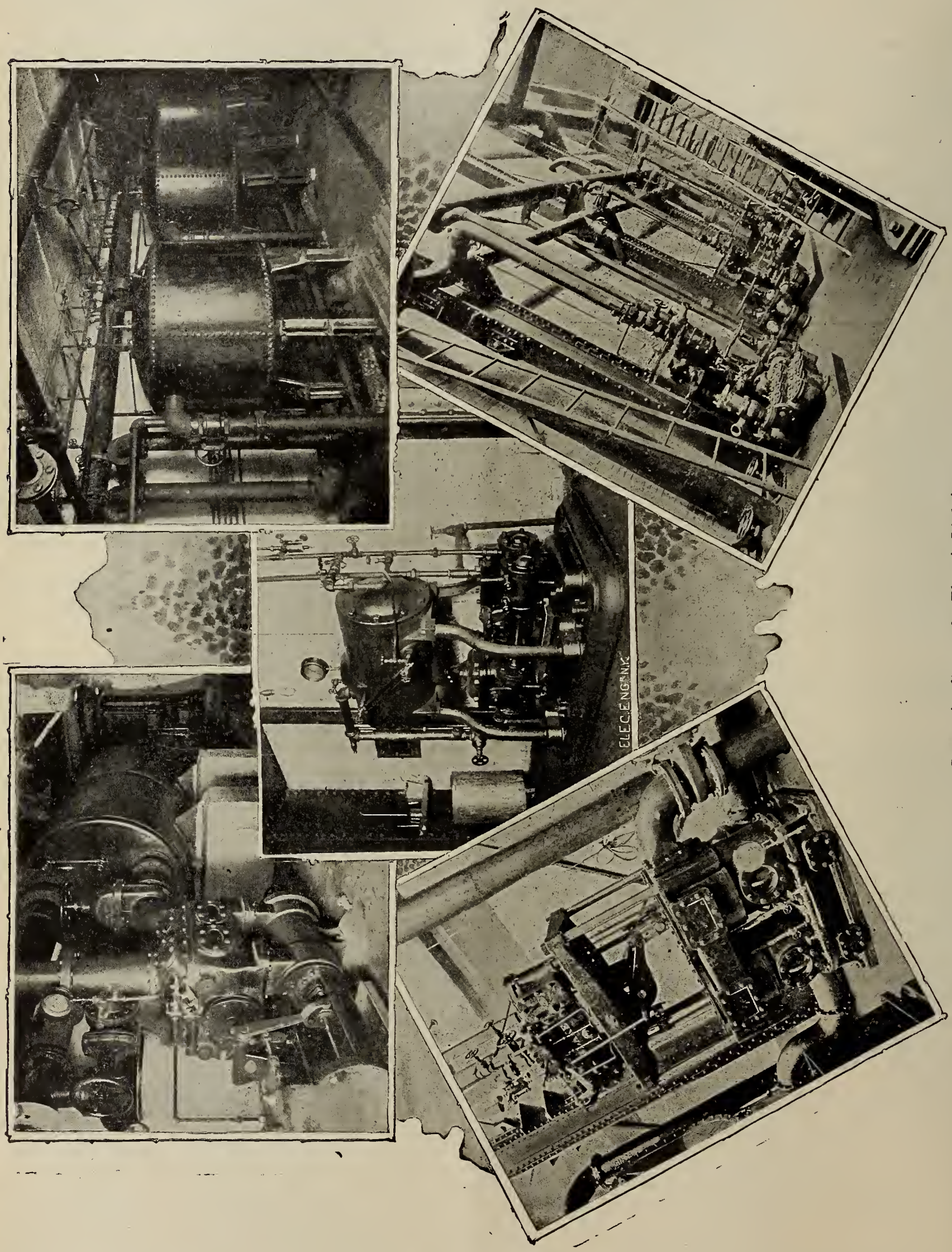
In an article by Prof. Thurston, in relation to the steam turbine, the following fact is stated: "An apparently important and, at least, new fact in the operation of the steam turbine is revealed by experimental investigations in progress for some time past in the laboratories of Sibley College with both saturated and super heated steam. Contrary to the usual theory of that apparatus it is found that a very substantial gain may be had by the use of super heat not only in efficiency but also in capacity."

In the light of this information it is merely a matter of experiment to discover to what limits this gain may be obtained and what proportion it bears to the additional heat supplied. It is of course known to our readers that all forms of steam engines are merely heating engines in which the vehicle or carrier of the heat is the vapor or steam which, in addition, possesses the peculiar property of expansion. But while undergoing this process the energy developed and systematically employed is merely that of the vibrating particles, all of which, in the aggregate, give up as heat that which they possess in the water of the boiler. So that the ultimate rotation of the fly wheel represents the sum total of these infinitesimal forces mechanically controlled and devoted to a useful industrial purpose.

In continuing the argument in favor of the use of super heat it has been discovered that the increase in thermodynamic efficiency amounts to one-tenth of one per cent. per degree of super heat or about two per cent. for every twenty degrees. Practical investigations, however, have shown that a gain of about one per cent. for every three Fahrenheit degrees of super heat is possible in a machine of the De La Valle type. The capacity of the turbine was also increased one hundred per cent. by the employment of thirty-seven degrees Fahrenheit of super heat and a reduction in the amount of water used of from forty-eight pounds to forty-four pounds, with the pressure rising from three atmospheres to eight. It seems that exact scientific conclusions have not as yet been reached in relation to this interesting field of investigation and a means of determining the exact rate of increase in efficiency and capacity with various degrees of super heat will be of the utmost value to steam engineers of a scientific turn of mind. In a chort classic to be found in the June 22d issue of "Science" Prof. Thurston discusses, under the head of "The Steam Turbine," some facts and figures in relation to this phenomenon.

The steam turbine is naturally adapted to the purpose of electric lighting by possessing certain mechanical features which create a similarity with it in in that respect and the generator it is driving. The absence of many valves and reciprocating parts allows a speed to be obtained of a magnitude far exceeding that possible in the ordinary type of engine. It is generally understood that the size and weight of engines and dynamos is a function of the speed, mathematically considered. In other words, for the same output in horse power or watts a higher speed means a reduction in weight and dimensions. Within certain limits this diminution in size can be carried out to a remarkable extent. The limitations imposed are those due to the natural weakness or strength of the materials composing the engine and generator. In addition, certain other things must be considered, such as air resistance, the lubrication of bearings and the centrifugal force. For electric lighting in large cities, where floor space is of great consequence, the employment of direct connected plants, turbine driven, means the lessening of expense to a considerable degree. Although in large electric light plants of the most modern type labor is reduced to a minimum by the use of automatic devices of every conceivable character in both the electrical and mechanical end of the plant still a compact and simpler class of machines will prove in the end more satisfactory and possibly less expensive to care for. By means of high speed of two thousand, three thousand or even five thousand revolutions per minute both engine and dynamo could be reduced down to their lowest terms; floor space and weight will become extremely limited and the area now required might be cut down fifty per cent. In addition, the greater economy would show reduction in the coal pile at the end

of the year as well as the expense list for repairs. With less floor space occupied by the machinery and these other items as above enumerated greatly reduced it in the general economy of the plant. In other respects the other pieces of machinery simplify certain processes and likewise reduce to a minimum the labor to be



Steam Appliances for Electric Lighting.
Interior of a Modern Electric Light and Power Plant, Showing Heating Apparatus, Boilers, Generators, etc.

would seem as though the steam turbine might prove an inviting financial proposition in the future to the proprietors or directors of large electric lighting corporations.

employed. It might be mentioned in connection with this subject that in certain plants it is almost impossible to separate the cost of fuel from the cost of labor relating to it in the sense that handling of said fuel calls

for the employment of a certain number of individuals whose wages are a constant negative profit in the year's totals.

In a perfect lighting and power station where the best of steam apparatus is employed for the purpose of gaining the highest efficiency in the combustion of fuel and the consumption of steam the handling of the fuel eats up many of the advantages gained through the improved machinery in use. In the Edison illuminating station, New York City, this idea is thoroughly appreciated and in consequence the fuel is handled almost automatically, two or three men or less being fully able to take care of a large battery of boilers. The gain through the use of power and heat saving devices is therefore shown in full at the end of the year, no subtraction of labor bills being necessary. The Chicago Edison station is another type of a large plant in which is employed the most modern of machinery, not only of an electrical but of a mechanical character.

The above are scenes from the same and prove conclusively that the profits of the electric light industry are to be found in the economical handling of the fuel and steam and are not, as was once supposed, entirely obtainable from the generation and distribution of the current.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED JULY 17, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

653,649. Underground System of Electric Railways. C. A. Balph, Pittsburgh, Pa.

653,685. Electric Cut-out. H. P. Maxim, Hartford, Conn.

653,698. Electric Switch. J. T. Robb, New York, N. Y.

653,708. Hydro-electro-therapeutic Apparatus. J. J. Stanger, Ulm, Germany.

653,713. Electric Clock. S. P. Thrasher, New Haven, Conn.

653,715. Apparatus for Electrically Treating Fabrics for Waterproofing or Other Purposes. J. T. Van Gestel, New York, N. Y.

653,716. Process of Waterproofing Fabrics. J. T. Van Gestel, New York, N. Y.

653,721. Telephone Transmitter. J. L. West, Omaha, Neb.

653,725. Electric Motor. D. C. Woodward, Hartford, Conn.

653,730. Telephone-transmitter Arm. J. F. Craven, Pittsburgh, Pa.

653,763, 653,764, 653,765. Electro-galvanic Battery. H. J. Brewer, New York, N. Y.

653,770. Galvanic Battery. A. Heil, Frankfort-on-the-Main, Germany.

653,784. System of Electrical Distribution. C. DeW. Anderson, Chicago, Ill.

653,785. Electric Arc Lamp. S. Bergmann, New York, N. Y.

653,806. Electric Meter. C. D. Haskins, Newton, Mass.

653,841. Electric Fuse. T. H. Brady, New Britain, Conn.

653,857. Electric Controller. F. H. Wise, Johnstown, Pa.

653,883. Secondary Battery. A. Reuterdahl, Providence, R. I.

653,885. Casing for Electric Car-lighting Apparatus. W. F. Richards, Buffalo, N. Y.

653,906. Alternating-current Motor. E. W. Brown, Dayton, Ohio.

653,933. Electrode for Electrolyzing Apparatus. Rene Moitz, Lille, France.

653,934, 653,935, 653,936. Page-printing Telegraph. D. Murray, New York, N. Y.

653,941. Telegraph Switching Apparatus. J. F. Skirrow, East Orange, N. J.

653,945. Commutator Segment. J. Burke, New York, N. Y.

635,957. Magneto-electric Generator for Gas Engines. G. W. Hendricks, Indianapolis, Ind.

653,963. Dynamo-electric Machine. W. E. Mordey, London, England.

653,970. Electric Railroad Track. E. Sollman, Hoboken, N. J.

653,982. Electric Headlight. J. W. G. Becker, Kansas City, Mo.

653,984. Electric Arc Lamp. H. C. Carleton, New York, N. Y.

654,067. Electric Low-water Alarm. Fred Leadbeater, Detroit, Mich.

654,103. Attachment for instruments of Precision. C. O. F. Schrottke, Berlin, Germany.

654,104. Measuring Instrument. K. O. F. Schrottke, Berlin, Germany.

654,105. Electric Railway Appliance. D. E. Shoop, Turtle Creek, Pa.

654,112. Telephone Call Register. Wm. Gray, Hartford, Conn.

654,113. Battery Electrode. G. Heidel, St. Louis, Mo.

Business News.

NEW INCORPORATIONS.

Caro, Mich.—A new electric light company has been organized here, with W. J. Gamble as secretary and manager. It is proposed to put in a $10,000 plant with storage battery, etc.

Dunkirk, Ind.—The City Light and Power Company, of Dunkirk, has been incorporated. Capital stock, $8,000; directors: John H. Brown, K. A. Tracy and M. J. Cook.

Chicago, Ill.—The Scientific Manufacturing Company, of Chicago, capital $50,000, has been chartered for manufacturing electrical and scientific instruments and devices; incorporators: H. L. Peters, E. J. Farrell, C. R. Harris.

Chicago, Ill.—The Economic Light and Power Company, of Chicago, has been incorporated to operate light, heat and power plants. Capital, $10,000; incorporators: E. C. Wetlen, D. T. Campbell, L. Spahn, all of Chicago.

Caro, Mich.—The Mutual Incandescent Lighting Company is the name of a new lighting company just organized in this city with a capital of $10,000. W. J. Gamble, a local capitalist, is the moving spirit in the enterprise. It is proposed to erect and equip a strictly modern plant.

Irondale, Ala.—Article of incorporation have been filed by the Irondale Water, Light and Power Company. The capital of the corporation is $100,000. The purpose of this incorporation is to maintain and operate a system of water and gas works and electric light and power plant. The principal place of business is Irondale. The incorporators are: F. W. Turpin, N. H. Sewall and Robert R. Zeil.

New York City.—The Seaside Electric Light, Heat and Power Company, whose operations are to be carried on in Queens Country, has been incorporated with the Secretary of State. The capital stock is $5,000, consisting of shares of $50 each, and the directors for the first year are: William Wainwright, John Remsen, Mrs. Sarah Tater, William G. Wainwright and John W. Wainwright, of New York city.

Zanesville, Ohio.—The Ben Franklin Electric Company has been incorporated with a capital stock of $10,000. The incorporators are: Joseph Shaw, W. W. Harper, S. A. Weller, Willis Bailey, Guy C. Fergus and Robert B. Reed. The purpose of the company is the manufacture of a combined burglar alarm and home call clock, the patent for which has been secured by Messrs. Fergus and Reed.

Peekskill, N. Y.—The certificate of incorporation of the Peekskill Lighting Company has been filed in the Westchester County Clerk's office. Its capital stock is $500,000, and the term of its existence 50 years. The directors are: Benjamin B. Nostrand, Jr., and Henry L. Armstrong, of Peekskill; H. Hobart Porter, Jr., Francis Blossom, Alfred Ely, Louise M. Fulton, Harold Binney, George H. Summerborn and Hillary C. Messimer, of this city; Richmond Talbot, of Tuxedo, and Henry S. Morton, of Hoboken, N. J.

Ann Arbor, Mich.—The Washtenaw Electric Company has filed articles of incorporation with the county clerk, placing its capital stock at $50,000. The purpose of the corporation is the producing of electricity and electric light. The offices are to be at Ann Arbor and Ypsilanti and the power plant at Geddes. Two thousand shares at $25 each are held by: Bernard Rorison, A. C. Rorison, W. J. Clarke, P. M. Miller, W. H. Sweet, C. L. Stevens, Robert Hemphill, Jr., A. Deyer, R. W. Hemphill, Clark Cornwell, H. P. Glover and R. W. Hemphill, Jr., trustee.

Elkhart, Ind.—The ownership of the stock in the Home Electric Light & Power Company of this city changed hands recently and the following are the new owners and officers as elected at a meeting held in this city: President, H. L. Crawford, New York City; Vice-President, P. F. Thompson, New York City; Treasurer, A. M. Barron, of this city; also appointed general manager and purchasing agent; Secretary, James DuShane, South Bend, Ind. The above, with Mr. C. H. Tenney, of New York City, form the directorate of the company. It is proposed to largely increase the already big business of the company by building a dam across the Saint Joseph River eight miles below this city, by which over 3,000 horse power will be added to the present plant here. Factories wishing to change their locations will be given the inducements of cheap electrical power and sites as an inducement to locate at Elkhart, where the shipping facilities are unsurpassed.

TELEPHONE CALLS.

East Orange, N. J.—The Automatic Telephone Meter Company, of East Orange, has been incorporated. Capital, $125,000; incorporators: C. Bate, W. Fairchild, E. J. McNulty.

Cuero, Tex.—The Cuero & Sasseville Telephone Company, of Cuero, has been chartered. Capital, $6,000; incorporators: Mrs. Jane Hunter, Mrs. Willie Breeden, Mrs. S. D. Weldon, all of Cuero.

Nacogdoches, Tex.—The Texas Gulf Telephone Company, of Nacogdoches, has been incorporated. Capital, $10,000; incorporators: E. C. Branch, George H. Davidson, K. K. Branch, W. S. Beeson, all of Nacogdoches.

Geneva, Ind.—The Geneva Telephone Company, of Geneva, has been chartered to operate telephone lines. Capital, $5,000; incorporators: H. M. Aspy, A. J. Miller, A. G. Briggs, T. Drew, O. O. Juday, all of Geneva.

Hagerstown, Ind.—The Hagerstown Telephone Company, Hagerstown, has been incorporated to operate a telephone line. Capital, $8,000; incorporators: J. Bowman, B. G. Jewett, J. M. Hartley, L. M. Pierce, all of Hagerstown.

Pittsburgh, Pa.—The West Pennsylvania Long-Distance Telephone Company, of Pittsburgh, has been chartered to construct and operate a telephone line. Capital, $10,000; incorporators: H. A. Parr, S. N. Browne, both of Baltimore, Md.; W. D. Evans, R. A. Spring, W. W. Handy, all of Pittsburgh.

STREET RAILWAY NEWS.

Camden, N. J.—The American Universal Underground Electric Railway Company, of Camden, has been incorporated to operate trolley systems. Capital, $200,000; incorporators: W. Bartram, J. M. Deal, W. C. Alexander, C. P. Ballinger.

New Albany, Ind.—The New Albany Street Railroad Company, New Albany, has been chartered to operate a street railroad. Capital, $30,000; incorporators: G. M. Clark, E. A. Hartmann, J. F. Newhouse, H. T. Meyer, J. H. Strack, all of New Albany.

Florence, Colo.—The Florence Electric Street Railway has been incorporated with a capital stock of $500,000. It will operate railroads in Fremont, Teller, El Paso, Pueblo and Custer counties, and will supply electric power for the general trade. The incorporators are: H. A. Cook, James Reed and Harry Robinson.

Hervy City, Ill.—Secretary of State Rose has licensed the incorporation of the Hervy City & Southern Electric Railroad Company. The company plans the construction of an electric road from Hervy City to Shelbyville. The capital stock of the corporation is to be $150,000. The principal office of the road is to be located at Macon. The incorporators and members of the first board of directors are: J. Smith Butrum, Decatur; Robert B. Hennigh, Prairie Home; Robert H. Woodward, Harold Woodcock and John M. Turner, of Macon.

AUTOMOBILES.

Plainfield, N. J.—The Plainfield Automobile Company, of Plainfield, has been chartered to deal in automobiles. Capital, $25,000; incorporators: G. W. Rockfellow, C. H. Hand, E. M. French, all of Plainfield; S. W. Drake, of Lincoln; C. A. March, attorney, Plainfield.



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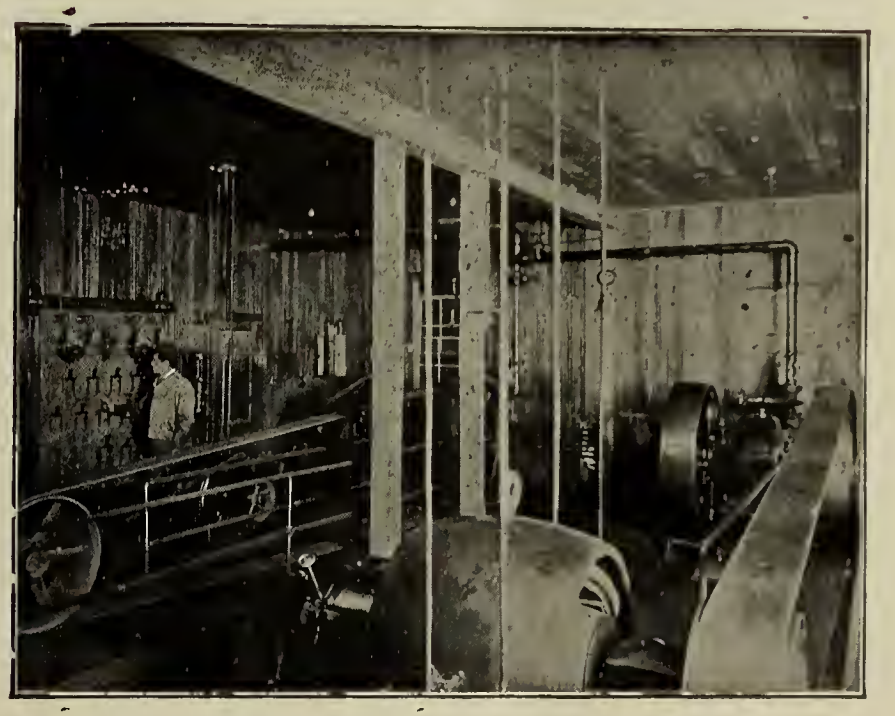
BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.

LONDON. Elliott Brothers No. 101 St. Martins Lane.

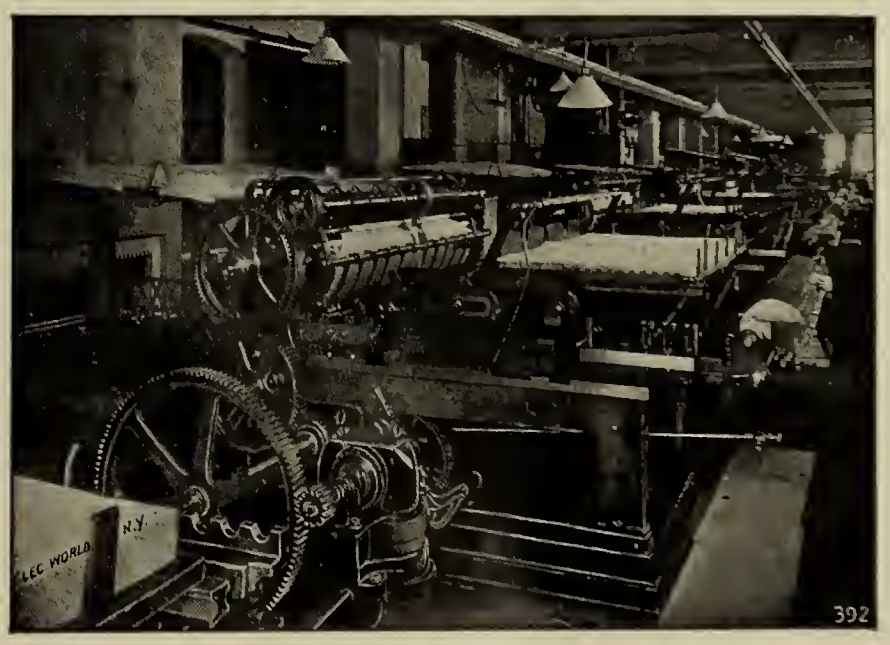
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Vol. XXVI—No. 6. NEW YORK, AUGUST 11, 1900 Whole No. 691.

Electricity vs. Steam.



Generating Plant Supplying Large Shop with Power.

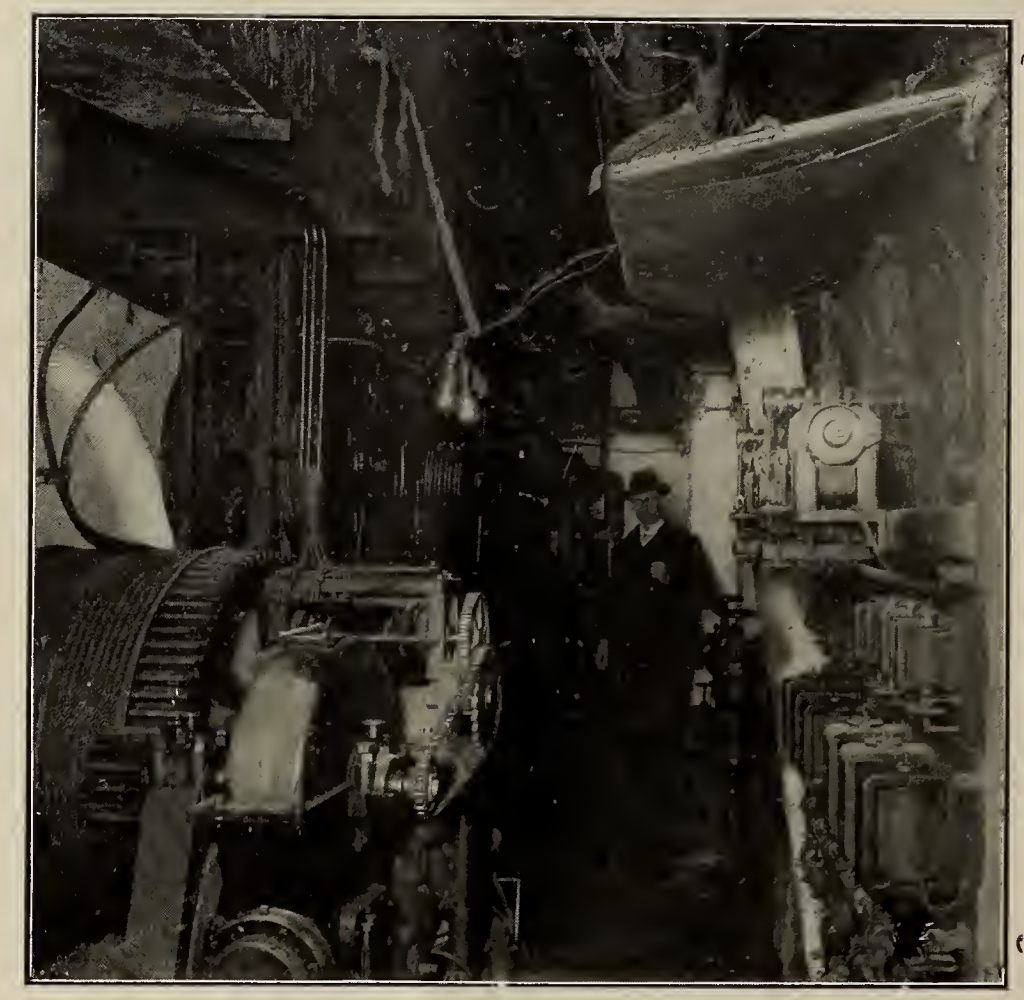


Application of Electricity to Printing.

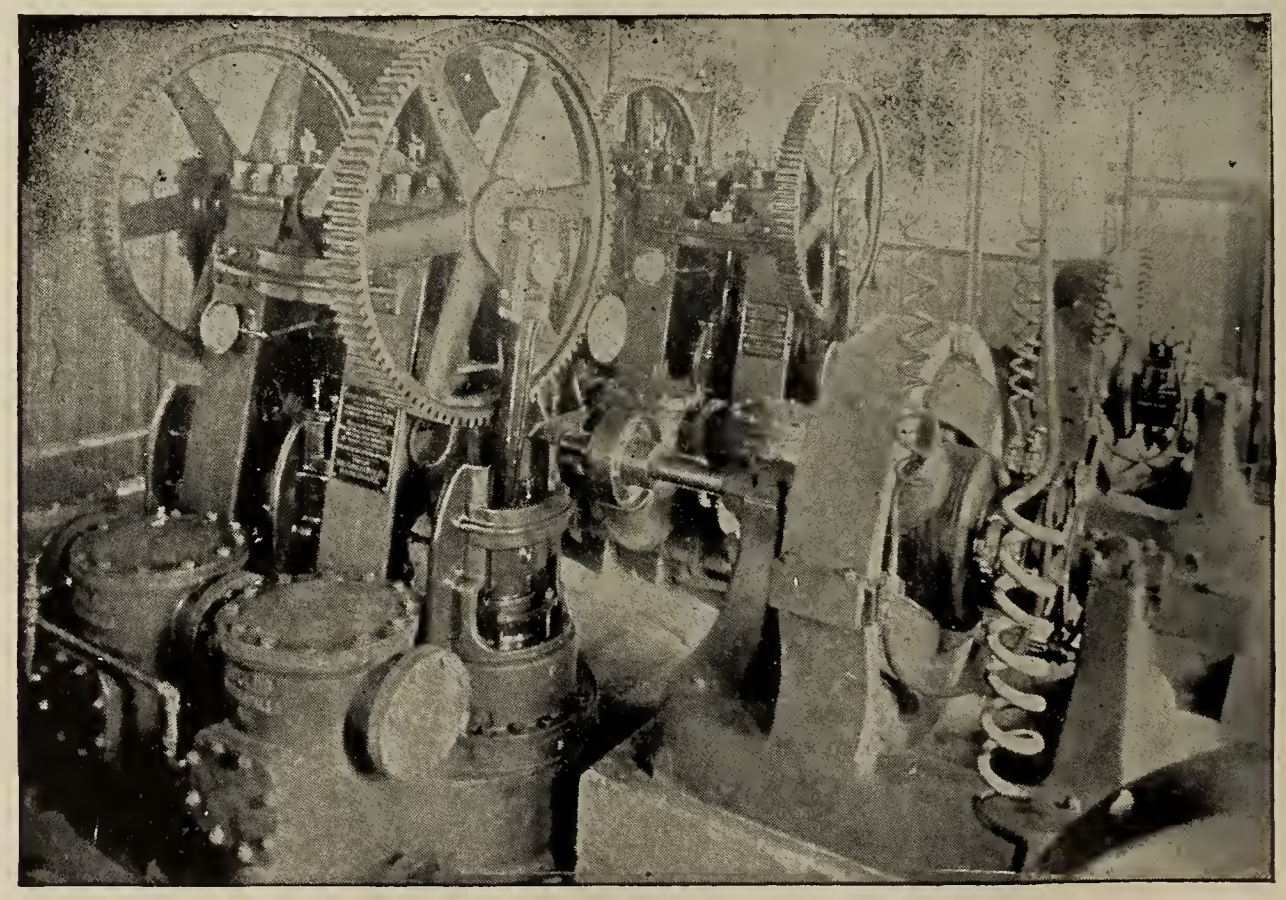
THE RELATIVE COSTS OF ELECTRICITY AND STEAM FOR MOTIVE POWER.

The general advantages of electricity over steam have been admitted by many of our best authorities. While in the majority of cases the cost of electricity, as generated by the combustion of coal, is such that its use is not prohibitive in comparison with steam yet cases do arise where it become a question as to whether the power applied had best be obtained from the expansion of steam direct or electricity. The many applications of electricity have brought it into common use and, in a sense caused those companies selling electricity to compete and thereby bring the price within everyone's reach. It has been frequently argued that power produced from the engine and carefully transmitted by means of good countershafting is cheaper than any other source of power at our command. Tests have shown, however, that the efficiency of countershafting is most questionable and losses of power are met with, between the prime mover and the tool that is operated, of such magnitude

that unless the greatest care is exercised and the countershafting frequently oiled and inspected not more than fifty or sixty per cent. of the power is serviceable. In other words, the transmitting apparatus between the steam engine and the tool invites a loss of power of about forty per cent. These figures are, of course, greatly reduced if the shafting is in alignment and well taken care of and possibly more if the reverse is true. Starting from the steam engine in both cases, other things being equal such as the boiler, method of firing, character of piping and style of engine, it would seem as though the relative economies established by the use of steam and electricity are dependent upon the following: In the case of belting and countershafting, as already outlined, the quality of this apparatus would govern the losses inherent to it. On the other hand, the dynamo generating electricity



[Electric Power for Elevators.



Application of Electricity to Pumping Machinery.

for distribution to various direct driven machines, the character of the wiring, etc., would, in many respects, comprise the items to be considered in estimating the efficiency of an electrical installation. Whatever would be true of direct connected machines driven by electricity would be true if they were further removed from the dynamo; if, for instance, the wiring and line extended a thousand or two thousand feet instead of a few hundred. The difference in efficiency and cost would depend entirely upon the dimensions of the wire. With an engine driving a dynamo of ninety per cent. efficiency and with a loss of five per cent. in the wiring, it is readily seen that the efficiency, with a variety of motors, varying in size from half horse to five horse or more, would not fall much below seventy-five per cent. On the other hand, with steam the efficiency would vary within wider limits. The engine, whose efficiency depends upon its point of cutoff, would not be able to respond as satisfactorily to a changing load as a dynamo. In consequence of this the sum total of the countershaft loss, belting loss, and hidden losses in the engine would aggregate in a very large shop at least forty per cent. Where the power distributed exceeds one thousand horse the use of electrical apparatus, aside from its efficiency, is immeasurably more convenient. Where power distribution and transmission are to be considered the fact has been firmly established that the only satisfactory means of sending the power from point to point is in the form of electricity and this is true in many cases of less magnitude and importance.

Miscellaneous.

STRAY CURRENTS.

A NEW ELECTRIC BATTERY.

In the new electric battery of Poppenburg, the positive electrode is a hollow cylinder of retort carbon filled with depolarizing matter and closed at the bottom by an insulating plate. The negative is a cylinder of zinc, and the two rest on a horizontal porous plate or diaphragm, beneath which is a thick layer of sulphate of soda, with or without a little common salt. When water is poured into the cell, part of it passes through the porous diaphragm, dissolving the salt. The solution passes by endosmose into the water above, forming an electrolyte that varies but slightly with time, and causes the battery to retain its strength for a long period. The electromotive force is about two volts.

A NEW ELECTRIC FURNACE.

The Stassano electric furnace, which has been tested in an experimental plant of 100 horse power near Rome, is claimed to reduce the cost of producing iron and steel about one-third. The apparatus resembles in appearance a blast furnace of very small size, the heat being supplied by an electric arc between carbons entering opposite openings at the bottom of the furnace and adjusted by hand. Carbonates and oxides are the ores usually treated. The former are first roasted, and it is necessary to powder all the ores and mix them with such proportion of carbon, lime, or silica as analysis may show to be necessary for producing the desired quality of metal, and then to form the powdered mixture into bricks with 5 or 10 per cent. of pitch under hydraulic pressure. The dried bricks are fed into the heated furnace, the treatment then lasting a little more than half an hour in a test producing a small ingot. The process is aided by the combustion of the carbon of the mixture, and the electric energy required for each ton of metal is estimated at 3,000 horse power hours. Further experiments are to be made with three furnaces of about 500 horse power each, capable of yielding about 4,000 tons of metal annually.

A VACUUM ELECTROSCOPE.

In a recent issue of the Elektrotechnische Zeitschrift there appears a description of a vacuum electroscope which has been constructed for experimental purposes. The apparatus has the form of a pear about 4 1-2in. in length, its top consisting of a hollow aluminium ball, which rests upon an aluminium wire welded into the glass. This wire projects into the interior of the electroscope, where it takes the form of a flat ribbon, to which the broad pendulum leaves are attached, these latter being of aluminium foil about 2-5in. long and 3-5in. broad. In the lower portion of the glass bulb are two platinum wires welded into the sides of the bulb very close together. Experiments with the instrument proved the vacuum to be a perfect insulator, and that delicate electrostatic effects might be obtained with it. The ordinary electroscope experiments succeeded when applied to the apparatus, though the heavy charges on the glass walls which occurred during these experiments had a disturbing influence. When the apparatus was observed in a dark room, no trace of luminosity was apparent in it during the occurrence of strong electrostatic effects. Discharges of electricity into a vacuum are therefore dark, from which it may be concluded that the phenomena of light are dependent upon the presence of material such as would be found in air.

ROENTGEN SOCIETY OF THE UNITED STATES.

The Roentgen Society of the United States will meet in New York City December 13 and 14, 1900, at the Academy of Medicine. Papers have been promised by eminent men abroad and here, and a very successful scientific meeting is assured. There will be offered advantages to the visiting members for instruction in X-ray work that cannot be had under any other conditions. It is especially desired that all hospitals using X-ray apparatus, X-ray studios, physicians, surgeons and dentists doing X-ray work, scientific investigators, manufacturers and dealers in X-ray apparatus of all kinds throughout the United States should at once send their names and addresses to the chairman of the Committee of Arrangements, Dr. S. H. Monell, 43 East 42d St., New York City, N. Y., so that they may be sent important notices regarding the meeting. This society is the only one of its kind in America, national in character, and for scientific purposes only. All those wishing to become members or read a paper before the society may communicate with the secretary.

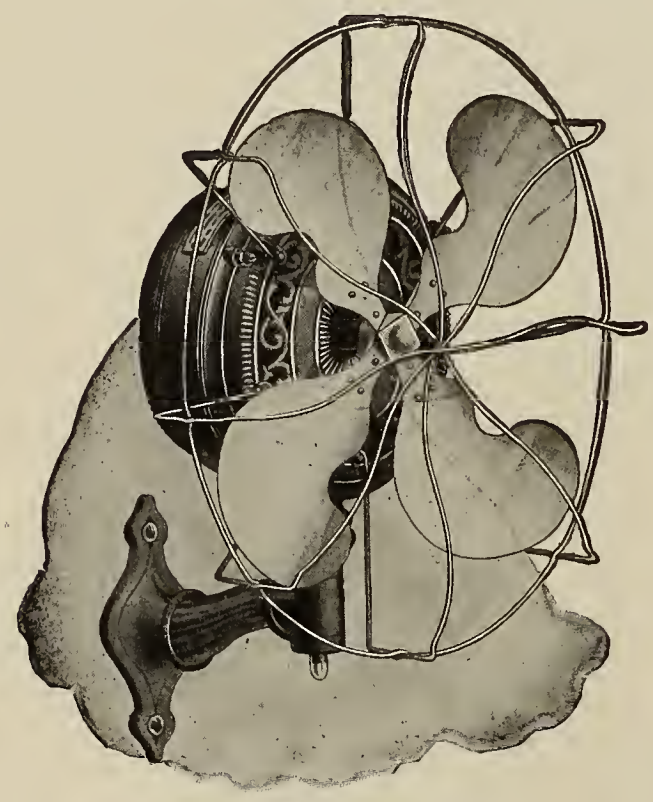
LITERARY NOTE.

The third edition of W. Stearns Davis's novel, "A Friend of Cæsar," has just been issued within three weeks of its publication. The first book of a young man still at college rarely meets with so prompt and so wide a reading. While its scenes are laid nearly two thousand years ago, Mr. Davis has not allowed the classical research needed for the work to prevent him, as the Outlook puts it, from telling a "story alive with human interest, aglow with passion, brilliant with quick-moving action, abounding in vividly told incident." The same reviewer speaks of Mr. Davis's method as "broad, the movement constant and steady, the plot and construction admirable."

Fan Motors.

A HOT WEATHER REMINDER.

The illustration shown herewith represents the bracket fan, or "breeze agitator," as it is called in the vernacular, of the Emerson Electric Manufacturing Company, of St. Louis, Mo. The armature of these fans is of the induction type, mounted on a hollow sleeve, running on a stationary hardened steel half-inch shaft. The tubular construction of the shaft, into which oil is fed from a cup on the back plate of the motor and running out of holes in it to both the front and back bearings of the armature sleeve, makes it impossible for it to escape in anyway. The lubrication is perfect on account of the above described inside feed. The switch attached to the motor allows of three variations in the speed, from a gentle



Emerson Bracket Fan.

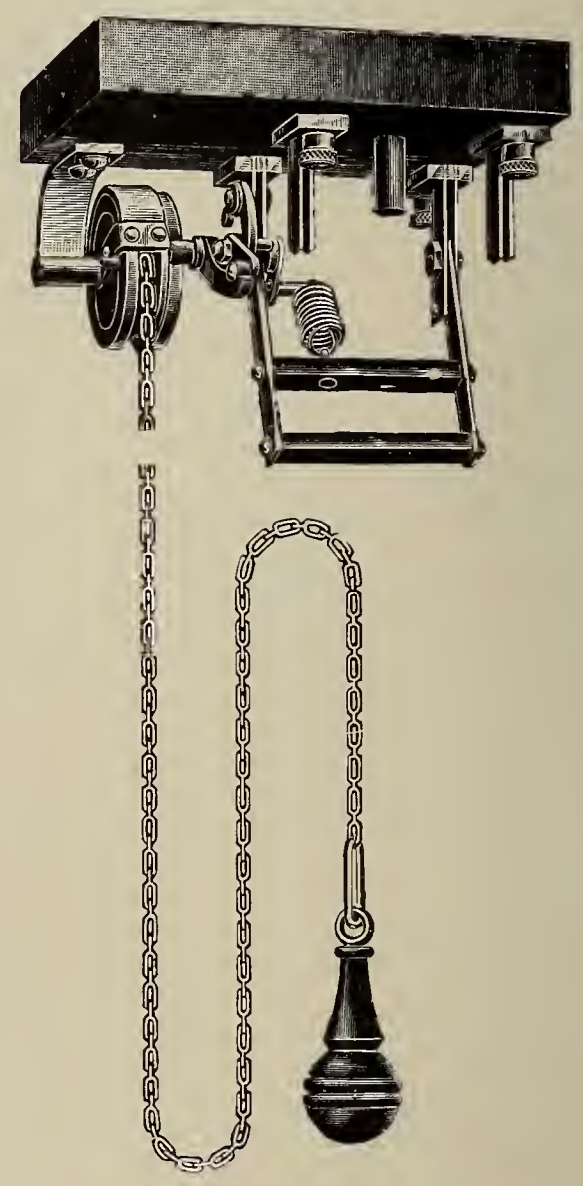
zephyr to a miniature cyclone. These fans are built in three sizes, 12, 15 and 16 inch, for 16,000 and 7,200 alternations per minute. The current consumption for the 12 inch, 7,200 frequency, fan is said to be 65 watts at running speed and 55 watts at slow speed. The peculiar shape of the fan blades, it is claimed by the Emerson Company, does away with the disagreeable humming noise met with in most fans. The base is a swiveling cast-iron bracket, adapted to be screwed to the wall. These fans are complete with polished brass guards and are handsomely finished in black enamel with gold and brass trimmings. Mr. T. T. Richards, the vice-president and general Eastern manager of the company, with offices at No. 136 Liberty street, New York city, carries a full line of the Emerson fans and will be pleased to send catalogues and price lists on request.

The production of pig iron in Germany so far this year is not quite equal to that of 1899. In April the production was 680,159 metric tons, as against 666,625 tons in April, 1899, and in the first four months of 1900 the production was 2,654,028 tons, against 2,658,443 tons in the first four months of 1899.

Electrical Specialties.

THE PERFECTION CEILING AND WALL SWITCH.

The J. Jones & Son Company, manufacturers, of 64 Cortlandt street, New York city, have placed the "Perfection" ceiling and wall switch on the market with a great degree of success. This switch possesses many interesting features which make it of great value to electrical engineers and contractors as well as consulting engineers in planning and installing the wiring of buildings. It is particularly useful in saving work in installa-



Perfection Ceiling and Wall Switch.

tions. No special wires need be run to it as it is placed in the main line. Its durability and simplicity of construction absolutely prevent it from getting out of order. It is almost self descriptive in the sketch. It is built of the best copper and when in operation a cam movement, operated by a strong chain with a handle attached, throws it on and off, one pull turning it on and another turning it off. The switch is both quick make and quick break and has been approved by the National Board of Fire Underwriters. It can be used on ceiling or wall. Circulars containing prices will be sent on application.

St. John, N. B.—The New Brunswick Telephone Company has decided to reconstruct its St. John, N. B., exchange, and instal the very latest plant, at a cost of over $100,000.

Centralia, Mo.—The Centralia Telephone Company, of Centralia, has been incorporated. Capital stock, $6,000; incorporated by J. A. Chance, A. B. Chance and Sallie Chance.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., } ELECTRIC LIGHT AND POWER.
OSBORNE P. LOOMIS, E. E., }
JOSEPH MUIR, M. D., } ELECTRO-
FREDERICK STRANGE KOLLE, M. D., } THERAPEUTICS.

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ELECTRIC RAILWAYS IN THE SOUTH.

It is interesting to observe the influence wrought by electric railways in the South. Over a great territory, constituting the eastern coast of the United States in the Southern section, from Virginia down a net work of electric roads is in operation, joining together by this means towns more or less remote from each other and, in some respects, inaccessible except by means of the trolley. In Virginia particularly, the electric road has wrought a great change. It has stimulated trade, has offered a more inviting prospect to the commercial traveler and been the means of actually developing many industries. The light carriage has been to a large extent abandoned and horseback riding, greatly in vogue until within a short time ago, has been found inconvenient and expensive in comparison with the five cent trolley ride. In the Southern States many of the roads that are fairly well laid are so hot and dusty that even horseback or buggy riding is intensely disagreeable. The trolley car, shooting along at a fairly high rate of speed, causes a breeze of the most refreshing character to blow upon the occupants, making travel in this manner an unmitigated pleasure.

In speaking to several commercial travelers, whose business in the Southern States extends over a period of many years, their unanimity of opinion, regarding the advantages of the trolley in facilitating business and saving time, is a sign that in many respects the trolley, as an adjunct to civilization, has been understimated. The vast numbers of colored people in the South have also found in the trolley a valuable aid in the earning of a livelihood. Through the trolley car they are able to travel to large towns and cities quickly and cheaply and find employment, while still living in modest homes in the country. This has had an influence upon the standing of many a negro community and is conductive to a higher life, or at least a more useful one, among this class of people. The constant repairs to the electric systems of both lighting and traction are also performed by the negro element, and in this way benefits have been derived from the electric car which are in every sense of a satisfactory character. In traveling through the South it is easy to realize that a boom to real estate has occurred in many cases, due to the advance of the trolley. The sites of many small towns have been laid through its near proximity and others through which it passes have been given a new lease of life. The electric railway is destined to play an important part in the near future when the inevitable transformation takes place in the trunk lines of steam roads, changing the motive power from steam to electricity and the present tracks into bonded rails.

The difficulty with long trunk lines stretching across the continent, operated by electric power, would be mainly due to the unavoidable delays through slight injuries to the system. These injuries during a storm might be sufficiently great to impede progress for hours and even days and, on the other hand, vandalism and certain unprotected parts of the system might cause the destruction of life and property. In other words, it seems as though the present trolley system were unable to meet with the strict requirements of practise. One of the first demands made by nature is that of strength in construction. Windstorms, snowstorms and even rainstorms might undermine or break down a trunk line trolley road of the ordinary type unless built in such a manner that the rigidity of its supports and solidity of construction insured its permanence. On the other hand, in a trunk line the feeding system would necessarily require particular care and the establisment of many relay stations along the route. These stations would either contain rotary transformers supplied from neighboring cities with a high tension current or possess all the apparatus necessary for the generation that the current required. In other words, two systems could be adopted; one in which each station, widely separated from its neighbor, was complete in itself as an independent power station, or a comparatively few huge power stations might be built along the line with smaller subsidiary stations, containing merely rotary converters, spoken of above. Other difficulties loom up in considering mountain passes and wild deserted stretches of country through which our western trains roar along. These risks summed up might, in the aggregate, represent too much care and responsibility as compared with the present system of rapid locomotion; yet the cost of transforming a steam line would not be enormous, although the entire system of railroading as it now stands would be to a large extent changed.

The Baltimore & Ohio Railroad has shown an enterprising spirit in testing the value of electric freight cars as compared with those driven by steam. Their experiment was eminently successful. If it were not for the time and expense involved the entire road might at present be known as one operated entirely by electricity. The New York, New Haven & Hartford Railroad have built and adopted a third rail electric system which operates with every degree of satisfaction to passengers. The New York Central road, probably the most conservative line in the country, have decided to adopt electricity as the motive power for cars passing through the Fourth avenue tunnel. The thin edge of the wedge has been inserted and within the next generation great changes will be noted in the operation of all trunk lines.

Expositions.

THE NORTH BAY.

The view here shown of the North Bay of Delaware Park, which is included in the site of the Pan-American Exposition, to be held at Buffalo next year, is taken from a point north of the site of the Albright Art Gallery. This is destined to be, in view of its magnificent surroundings, in the near future, one of the most beautiful reaches of water in the country. The bridge in the picture, graceful and substantial as it is, is to be replaced by a far more imposing and ornate structure. The bridge crosses a narrow neck in the Park Lake and carries the broad and beautiful driveway which leads from the main southern entrance at Forest avenue to the Exposition buildings. On the north side of the North Bay will stand the fine substantial and permanent building to be erected by the State of New York, and which will become, after the Exposition, the home of the valuable collection of Indian, colonial and pioneer relics and library owned by the Buffalo Historical Society. Opposite the New York State building on the south side of the bay will stand the Albright art gallery, which is to serve the purposes of the Exposition for the Department of Fine Arts. This building is the gift of Mr. J. J. Albright, of Buffalo, to his fellow citizens. It is to be strictly fire-proof, of white marble, in the ionic style of architecture, and will stand on a broad terrace sustained by a wall of granite blocks. The building will be 250 feet long by about 150 feet wide, and is to be of such a substantial character as to withstand the elements for many generations. It will become the public art gallery of Buffalo at the close of the Exposition, the Buffalo Fine Arts Academy having the custody of the property.



AN ADVERTISEMENT THAT ADVERTISES.

A copy of the New York Central Railroad's new standard folders, forms 100 and 101, which we believe are the most complete and comprehensive railroad folders ever printed, has come to hand. They contain the general time tables of the New York Central and brief reference to the time tables of scores of connecting lines. They emphasize and illustrate the Albany gateway, using in connection with the illustration this comprehensive paragraph: "Through this 'open door' passes the commerce of a nation over the 'New York Central Lines,' the Erie Canal and the historic Hudson river."

They also give a fine illustration of the New York Central's new million dollar passenger station at Albany. They contain a page map of the city of New York, showing the city from the Battery to the Harlem river and from the Hudson river to the East river. They call attention to the interchangeable mileage tickets issued by the New York Central, also to the fact that passengers can stop over at Niagara Falls, giving two fine illustrations of the Falls. They devote four pages to a very handsome map printed in two colors, of the territory from Boston on the east to St. Louis, Cincinnati and Chicago on the west, and from Montreal and Quebec on the north, to Richmond and Louisville on the south. They give portraits of the New York Central's steamship agents who meet incoming steamers at New York, and also of the New York Central's agent at San Francisco who meets all steamships coming in at the Golden Gate of California. They call attention to the New York Central cab and carriage service.

No. 101 devotes four pages to the English railways—London & Northwestern, Great Eastern, Midland, and Southeastern, Chatham & Dover. No. 100 devotes three pages to the Pacific ocean steamship lines, sailing from San Francisco, Portland, Tacoma, Seattle and Vancouver. They both contain notices of the Pan-American Exposition to be held at Buffalo in 1901. They devote a page to the dining car service, and another page to describing the Albany gateway. They call attention to the opportunity to stop over at Niagara Falls, and give a page on the "Center of New York," and devote two pages to Boston's new South station, the New England terminus of the New York Central lines. They give two full pages of the names of agents in Austria, Australia, Algeria, Belgium, Bulgaria, Burmah, Ceylon, China, Denmark, Egypt, France, Germany, Great Britain, Hawaiian Island, India, Italy, Japan, Java, Korea, Monaco, New Caledonia, Norway, New Zealand, the Netherlands, Palestine, Portugal, Philippine Islands, Russia, Spain, Servia, Syria, Switzerland, Sweden, Sumatra, Siberia, Siam, and the Straits Settlements, who keep for inspection copies of the New York Central's "Four Track Series," time tables, maps, etc.

A copy of either of these folders will be sent free, post-paid, to any address on receipt of a postage stamp, by George H. Daniels, general passenger agent, New York Central Railroad, Grand Central Station, New York.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.
PATENTS ISSUED JULY 24, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

654,130. Electric Steering Gear. H. W. Buck, Schenectady, N. Y.

654,138. Electric-current Grounding Device for Fire-extinguishing Apparatus. W. A. Dennett, Springfield, Mass.

654,187. Electrical Safety-fuse. A. L. Stevens, New York, N. Y.

654,207. Incandescent Lamp. S. D. Washburn, Boston, Mass.

654,208. Incandescent Electric Lamp. S. D. Washburn, Boston, Mass.

654,239. Electric Switch. William Ely, Providence, R. I.

654,277. Electric-arc Lamp. H. Peeper, Fils Liege, Belgium.

654,299. Starting Mechanism for Alternating Current motors. J. J. Wood, Fort Wayne, Ind.

654,310. Junction Box. Rudolf Hundhausen, Wilmersdorf, Germany.

654,320. Electric Heater. R. R. Morrison, San Francisco, Cal.

654,325. Automatic Switch for Electric Car-lighting Apparatus. W. F. Richards, Buffalo, N. Y.

654,326. Voice-concealing Device for Telephone. H. P. Roberts, Boston.

654,355. Electric Gas-lighter. J. Y. Parke, Philadelphia, Pa.

654,367. System of Distribution. Elihu Thomson, Swampscott, Mass.

654,390. Induction Coil. R. A. Fessenden, Allegheny, Pa.

654,391. Locking Device for Armature Oil-guards. A. J. Gairing, Johnstown, Pa.

654,420. Ore-stamp. D. M. Smith, Pasadena, Cal.

654,433. Incandescent-lamp Socket. W. B. Bragdon, Cumberland Mills, Me.

654,463. Electric Furnace. H. Leleux, Paris, France.

654,498. Electric Metering System. F. E. Town, Glencarlyn, Va.

654,519, 654,520. Secondary Battery. C. J. Coleman, Chicago, Ill.

654,531. Electric Bell. C. H. Furgason, Binghamton, N. Y.

654,551. Means for Regulating Electric Motors. R. Lundell, New York, N. Y.

654,557. Secondary Battery. D. Tommasi, Paris, France.

Business News.

FOSTER ENGINEERING COMPANY.

The Foster Engineering Company, of Newark, N. J., manufacturers of pressure regulators, reducing valves, pump governors and other high grade steam specialties for all pressures of steam, water, gas, or air, are building a new factory at Nos. 107-113 Monroe street, one hundred feet square and three stories high, with fireproof floors. This will give them a floor space of over 25,000 square feet; at present they occupy only about 4,800. The new factory will be completed about September first and both plants will be run until next spring. They will install about $15,000 to $18,000 worth of new machine tools, a 12 K. W. C. C. dynamo and a Westinghouse compound engine, 8x13x8. The latter will carry 300 pounds pressure at the boilers and will be used for testing the Foster Company's specialties and also for running the works.

NEW INCORPORATIONS.

Moline, Ill.—The Watkins Automatic Electric Current Regulator Company is about to incorporate with an authorized capital of $100,000.

Bath, N. Y.—Bath Electric & Gas Light Company. Capital, $100,000; directors: N. W. Dalton, M. A. Dalton and J. F. Parkhurst, Bath.

Syracuse, N. Y.—The Syracuse Arc Lamp Company was recently formed to manufacture arc lamps. Capital, $5,000; directors: L. W. Emerick, J. H. Cox, J. W. Stephens, all of Syracuse.

New York City.—Ideal Electric Contracting Company, of New York city. Capital, $1,000; directors: Henry Nekritz, William E. McKeen and Adolph Hirschfield, New York city.

Mount Lassen, Cal.—The Mount Lassen Power Company was incorporated by A. Hochheimer, Charles L. Morrill, Francis Smith, R. M. Sacltzer, A. F. Johns, H. L. Shannon and Park Henshaw, with a capital stock of $1,000,000.

New Albion, N. Y.—Cattaraugus Electric Light and Power Company, of New Albion, Cattaraugus County. Capital, $12,000; directors: A. J. Setter, Collins Centre, and Frank Crawford and H. P. Bishop, Cattaraugus.

Kenton, Ohio.—The Citizens' Electric Light and Power Company, of Kenton, has been incorporated for producing and supplying electric light. Capital, $20,000; incorporators: John Glenn, W. A. Ross, Theo. Miller, Jacob Ferbing and W. L. Sinly.

Lisbon, N. H.—The Granite State Electrical Works, of Lisbon, with a capital of $25,000, has been incorporated under the general laws. The company is organized to wind wire, and the parties interested are: H. C. Libby, H. H. Atwood, Alvin I. Currier, J. W. Richardson and Warren Williams.

Fort Miller, Cal.—The Fort Miller Power Company has been incorporated by Walter Saunders, Alfred J. Morgenstern, Thomas O. Carter, Fulton G. Barry and K. D. McCann, with capital stock of $1,000,000, of which Saunders and Morgenstern subscribed $440,000 each, Carter $100,000, and the other two subscribed $10,000.

New York City.—With a capital of $2,500,000, the New York & Queens Electric Light and Power Company has been incorporated with the Secretary of State. It purposes to manufacture and use electricity for producing light, heat and power, and in lighting streets and buildings in Queens and Nassau counties. The capital stock is to consist of 25,000 shares of $100 each. Half of the capital is to be preferred stock, entitled to a five per cent. non-cumulative dividend. The directors are: Henry H. Wilson, of New York city, and Thomas W. Stephens and Harry L. Snyder, of Montclair, N. J.

Rutland, Vt.—Articles of association have been filed for the Chittenden Power Company, capital stock, $50,000, which corporation proposes to do business with headquarters at Rutland. The shares are 500 of $100 each, and the incorporators are: Homer L. Hoag and Henry O. Carpenter, of Rutland, and Geo. H. Davis, Fletcher D. Proctor. The purpose of the corporation is to develop, construct and operate power plants to produce, transmit and sell power, light and heat of electricity or otherwise.

TELEPHONE CALLS.

Blissfield, Mich.—The Blissfield Telephone Company has increased its capital stock to $4,000.

London, Tenn.—The London & Paint Rock Telephone Company has been incorporated to construct and operate telephone lines. Capital, $500; incorporators: J. H. Bell, J. D. Taliaferro, J. P. Simpson, J. G. Greer, W. S. Williams, all of Nashville,

Otisco, N. Y.—The Otisco & Cedarville Telephone Company, of Otisco, to operate a telephone line from Otisco to Syracuse. Capital, $1,500; directors: H. D. Pomeroy and I. W. Barwell, Otisco; Lee Cummings, Navarino.

Detroit, Mich.—The National Telephone Equipment Company has been incorporated with $100,000 capital; incorporators: Hugh O'Connor, 3,334 shares, and William C. Sterling, Jr., and Edward H. Parker, 3,333 each.

Lockport, N. Y.—Home Telephone Company, of Lockport, to construct and operate a telephone line connecting the principal points in the county of Niagara. Capital, $125,000; directors: M. B. Butler, Niagara Falls; George H. Frost, Buffalo; A. E. Lord, S. R. Rawson, I. H. Griswold, James A. Drake, F. H. Sudro and F. W. Martin, Elydia, Ohio.

Milwaukee, Wis.—Crawford County farmers have organized a telephone stock company, and will complete thirty miles of system, in the western part of the county, by August 1. The officers are: President, James Fisher, Jr., of Eastman; vice-president, Dr. C. E. Cole, Prairie du Chien; treasurer, A. N. Scoville, Seneca; superintendent and secretary, C. H. Speck.

Chicago, Ill.—The Strowger Automatic Telephone Company has received $350,000 from the imperial government in final payment for the German patents and rights to use the Strowger automatic switch. The total amount paid for control of the patent in Germany was $500,000. The switch is now in use in Emperor William's palace and all department buildings of the German government.

STREET RAILWAY NEWS.

Hudson, Mass.—The Clinton & Hudson Street Railway Company has been authorized by the State Board of Railroad Commissioners to increase its capital stock from $100,000 to $160,000. The company asked for permission to issue $75,000.

Chattanooga, Tenn.—The North Side Consolidated Street Railroad Company, of Chattanooga, has been chartered to construct and operate a street railroad. Capital, $100,00; incorporators: S. W. Divine, W. B. Royster, E. D. Lilly, C. D. Divine, J. B. Sevier, all of Chattanooga.

Wilmington, N. C.—At the annual meeting of stockholders of the Wilmington Street Railway Company the following board of directors was elected: T. A. McIntire, C. A. Leib, B. F. O'Connor, O. T. Crosby, J. H. Barnard, J. W. Martenis and H. A. Whiting. The directors are all of New York, and the meeting to elect officers will be held there.

Detroit, Mich.—Articles of incorporation for the new Pontiac, Orion & Detroit Railway have been filed at Lansing. The capital stock is $200,000, of which $111,300 has been subscribed, and the incorporators are: Charles W. Ryan, J. Wm. Ryan and E. J. Wehrle, of Toledo; Geo. E. Fisher, Frank Howard, Michael Brennan and O. D. Chase, of Detroit, and George Hogle and George E. Beardslee, of Pontaic.

Greensburg, Pa.—Stockholders of what was the Greensburg, Janette & Pittsburgh Electric Railway Company held a meeting at Greensburg lately. A reorganization was effected and the name of the corporation was changed to the Westmoreland Railway Company. The following officers were chosen for the current year: President, Edward Bailey, Harrisburg; vice-president and treasurer, Robert McMeen, Mifflintown; secretary, C. L. Brinser, Greensburg; directors: Major Lane S. Hart, Hon. B. F. Myers and Edward Bailey, Harrisburg; Robert McMeen, Mifflintown, and C. L. Brinser, Greensburg.

DIVIDEND AND OTHER NOTES.

Boston, Mass.—The directors of the New England Telephone and Telegraph Company have declared a regular quarterly dividend of $1.50, payable August 15. Books will be closed August 1 to August 14, inclusive.

Pittsburgh, Pa.—The directors of the Westinghouse Electric and Manufacturing Company have declared a quarterly dividend of one and one-half per cent. payable August 15. Books closed August 1, and reopen August 16.

Schenectady, N. Y.—A certificate of increase of capital stock of the General Electric Company from $20,827,200 to $25,242,200, an increase to the amount of $4,415,000, has been filed with the Secretary of State, at Albany, N. Y. The amount of capital fully paid in is $20,827,200, and the whole amount of debts and liabilities does not exceed $7,200,000.

NEW YORK NOTES.

MR. F. C. BRUCKNER announces to his old friends and customers that he has established himself in the business of manufacturing high grade interior and long distance telephones and switchboards, installing of telephone systems, electric lights, motors, annunciators and bells, under the name of The F. C. Bruckner Electric Company, with offices in the Electrical Exchange Building, 136 Liberty street, where he will be happy to serve them in his usual prompt and faithful manner.

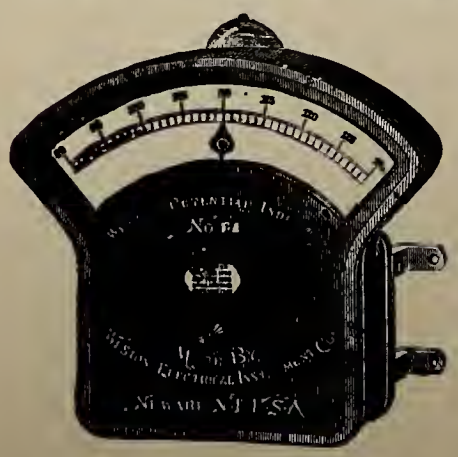
MR. C. T. HILLS, the well known New York representative of an electrical company, resigned his position with them on July first and bought a large interest in the H. T. Paiste Company, of Philadelphia, Pa., makers of electric light supplies. Mr. Hills is now the vice-president and general sales agent of the company and carries a complete line of the well known Paiste specialties at his old address in the Havemeyer Building, 26 Cortlandt street.

MR. FRANK ROTH, electrical engineer of the Long Island Railroad, has resigned and now occupies the position of superintendent of shops of the Brooklyn Rapid Transit Company.

MR. RALPH W. POPE, the well known and popular secretary of the American Institute of Electrical Engineers, sailed for Europe last week to make preparations for the ojint meetings of the American and English societies in London and Paris.

WESTON STANDARD ILLUMINATED DIAL

STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

114-120 William St., Newark, N. J., U. S. A.

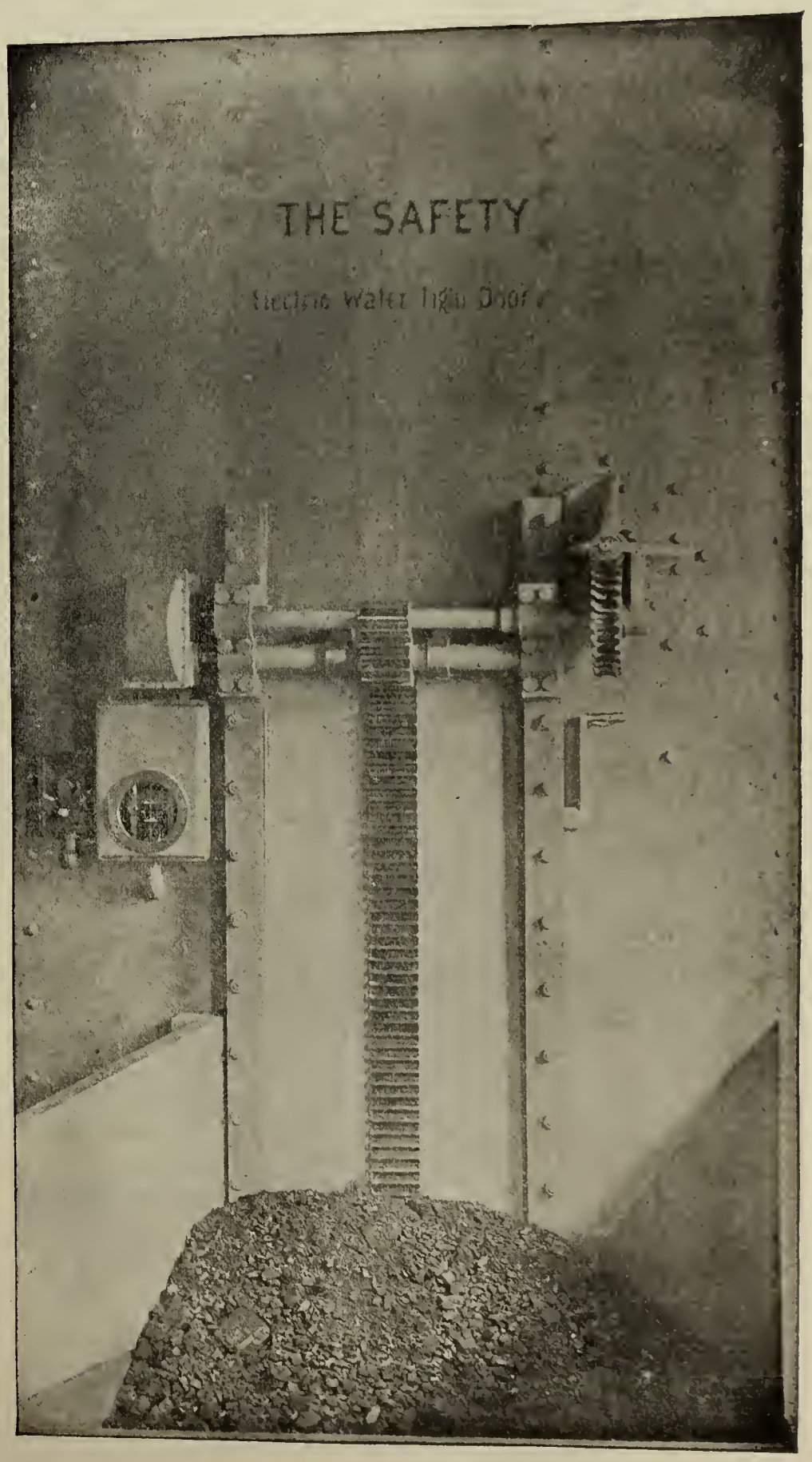
BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.

LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 7. NEW YORK, AUGUST 18, 1900. Whole No. 692.

Electric Protective Systems.



Test with Coal. Door Closed Through Coal.

THE SAFETY SYSTEM OF ELECTRIC WATER-TIGHT DOORS.

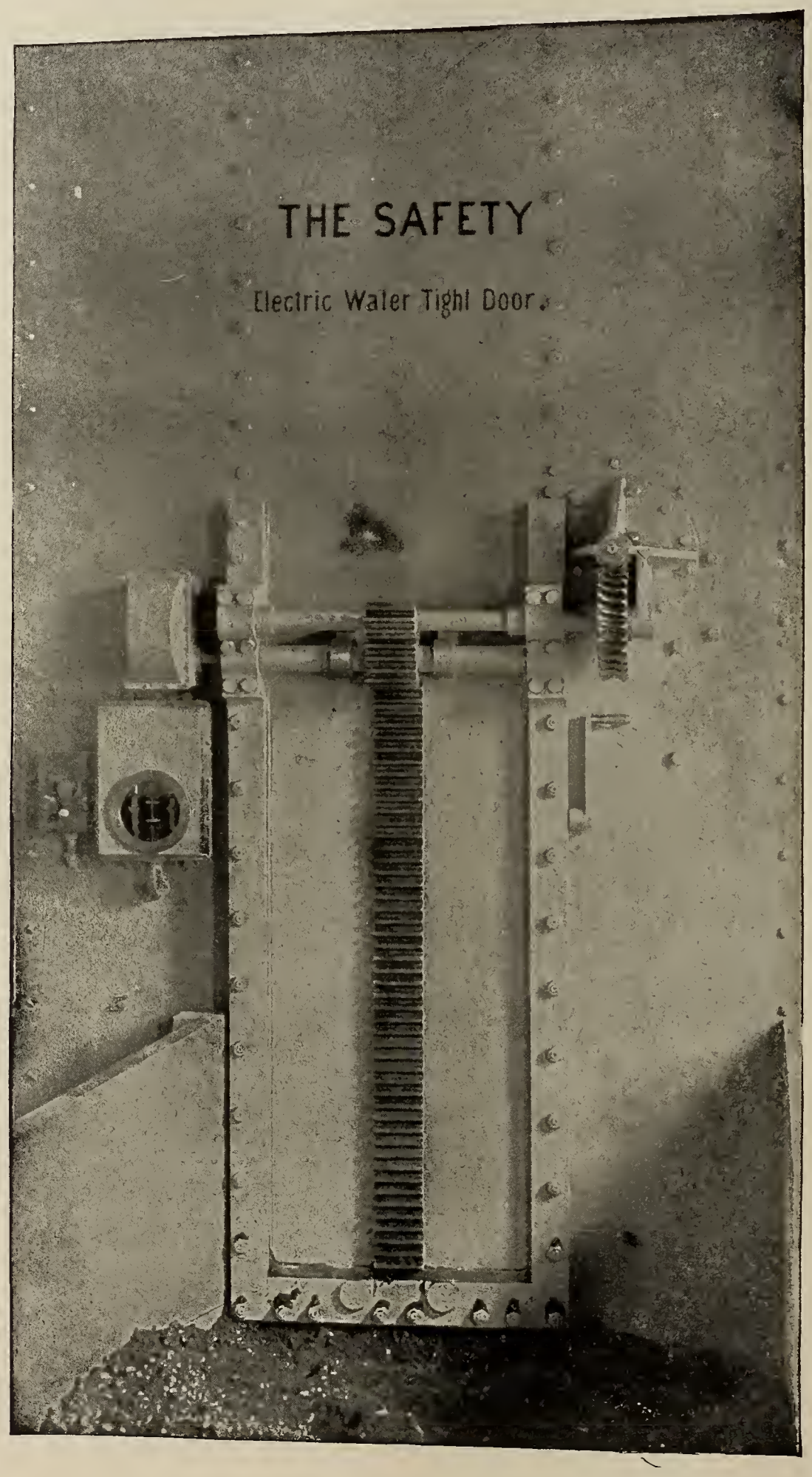
A modern seagoing steamship, whether battleship or of the merchant marine, would undoubtedly be considered unsafe if it were not provided with water-tight bulkheads, dividing its hull into several distinct compartments. Inasmuch as the ultimate efficiency of such water-tight compartments depends upon their integrity when an emergency arises, and as every bulkhead is pierced below the water line by one or more openings for entrance and egress, it becomes of the greatest importance to have these openings provided with doors

that may be closed quickly, conveniently and surely.

Aside from doors operated solely by hand—and the inadequacy of these has been fully demonstrated—there are now known three methods or systems of power operated doors: 1, hydraulic; 2, pneumatic; 3, electric.

Pneumatic doors are now in an experimental stage. The difficulties attendant upon this mode of control are quite as numerous and as serious as with the hydraulic.

With full appreciation of the defects and limitations of both hydraulic and pneumatic systems, The Sprague



Test with Coal. Coal Cleared Away Showing Door Fully Seated.

Doors controlled hydraulically have been tried experimentally upon a United States cruiser. These served to demonstrate very clearly the important advantages of a power door, but owing to many difficulties inherent with the system, hydraulic control has been abandoned.

Electric Company presents the Safety System of Electric Water-tight Doors with perfect confidence that in this system not only are the defects of the fluid systems entirely avoided, but that owing to its many advantages and superiorities, it is the logically correct and ultimate

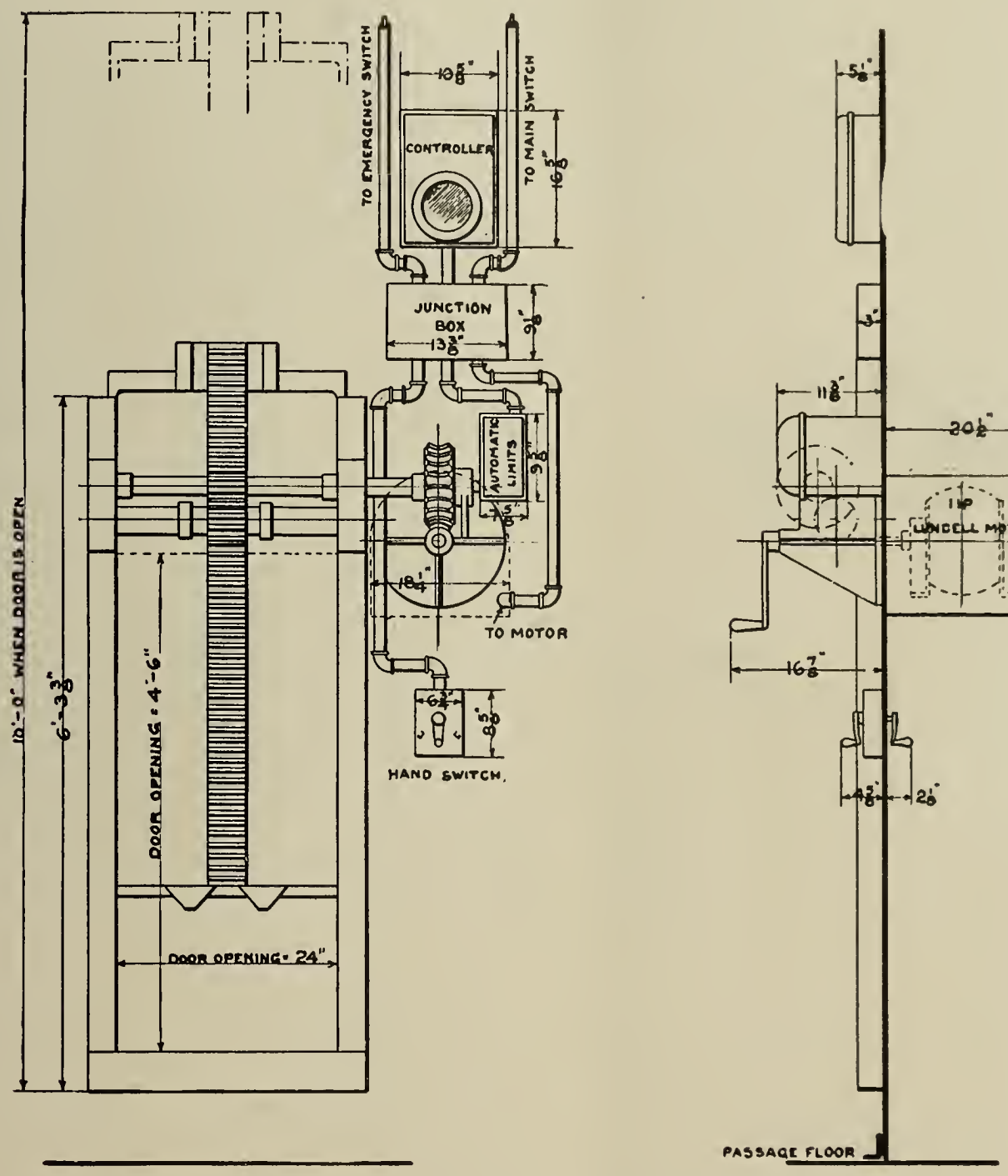
method of door control. The Safety door is the invention of Naval Constructor Francis T. Bowles, U. S. N., whose ability and wide experience in the construction of ships and the auxiliary apparatus for use on shipboard, makes his judgment on these matters beyond all question. The details of construction and control have been most carefully worked out in conjunction with and under the direction of Mr. Bowles, by the Sprague Electric Company, which has had many years' experience in building automatically-controlled electric devices. The Safety system meets perfectly every requirement for a bulkhead door that has been outlined by authorities on

Fourth. There is at each emergency station a positive and reliable indicator by which the closure of each door is made known.

Fifth. The operation of the emergency closing in no way interferes with the local operation by hand or power.

Sixth. The local control of power has precedence over the emergency closure, so that independent of such closure, a door may be stopped or opened for egress. After the local switch is released the emergency again assumes control and closes the door.

Seventh. The leads which supply power, and which control the doors as well as the operating mechanism,



Dimensional Plan of Vertical Door No. 1, and Control.

this subject, or found desirable from experience.

First. The door can be raised or lowered by power, or by hand, by one operator at the door on either side of the bulkhead.

Second. It will close either against a rush of water or against a rush of mixed water and coal, or through coal on the door sill due to the first opening of a full bunker.

Third. It is possible to close by power from the bridge, or from one or more central or emergency stations, any desired group of doors, or all the doors simultaneously, or in any degree of succession.

are unaffected by any temperature conditions existing on board ship.

Eighth. The doors have no tendency to "creep," and will remain in any position without expenditure of power to hold them.

Ninth. The power is taken from the main generating plant of the ship, and requires no auxiliary central station or apparatus under continual and wasteful operation.

Tenth. There are no valves, springs or packing, which are subject to continual deteriroation and require constant care.

(To be concluded)

Electrical Specialties.

CREST INDESTRUCTIBLE SPARKING PLUG.

The Crest Manufacturing Company of Cambridgeport, Mass., manufacturers of Crest motors for automobiles, are putting on the market a radically new design of sparking plug, that is not affected by heat and expansion and is consequently unbreakable.

After a considerable expense in experimenting with the best porcelains of foreign manufacture, they have, through the assistance of a well known chemist, discovered a new material that is unbreakable by heat or expansion. They have had these sparking plugs in use for a long time on their motors without any reports of failures and have decided to introduce them to other manufacturers and users of other makes of motors.

It is well known that the sparking plug is a delicate piece of mechanism and gives considerable trouble, and the failure of motors can, as a rule, be traced to the failure of the sparking plug, and for this reason all automobilists are compelled to carry one or two spare plugs in their kit.



The Crest Indestructible Sparking Plug.

Although the jump spark method is the most largely used to-day, on account of the simplicity, it would be universally used in preference to the contact and wipe spark methods if it was not for the trouble of the sparking plug with its liability to crack with the intense heat of the motor, short circuiting the secondary circuit.

The material used in this plug is a perfect electrical non-conductor, and does not expand under intense heat. It is a soft, tough material, not being brittle like porcelain.

The sparking plug, as shown in the cut, consists of a shell of steel having a thread at one end to screw in the orifice of the chamber of the motor.

The sparking plug proper consists of a slight cone of this new material, which is inserted in the steel plug. This cone fits tight in the shell, making a gas tight joint, without packing, making the plug proof against carelessness in the hands of unskilled persons. Through this cone a wire is passed terminating at the bottom of the plug, with an enlarged head. A platinum wire is inserted in the body of the steel shell, the spark jumping across between the two joints.

These plugs are sold singly or in lots of 25 to 100 to the trade. Directions go with each plug.

PICKING CHICKENS WITH AN ELECTRIC FAN.

The Kansas City Times notes the device invented by a local packing house employe for picking chickens. There is a receptacle in which the fowl is placed after being killed, and into this are turned several cross currents of air from electrical fans revolving at the rate of 5,000 revolutions per minute. In the twinkling of an eye the bird is stripped of its feathers, even to the tiniest particles of down, and the machine is ready for another.

Miscellaneous.

LIGHTING CITIES IN HAITI.

U. S. Minister Powell states that the Haitian government has concluded to furnish light to its cities, and in future not to grant concessions for this work to others. The government will cancel all concessions and pay the holders for their plant and for such amounts as have been expended by them. The government also promises to introduce a system of electric lights for the capitol in the early fall.

A NEW GERMAN ARC LAMP.

A new arc lamp, which seems to be of German origin, is designed to avoid the inconvenience of regularly renewing the carbons. It consists of a vacuum bulb containing two L-shaped aluminium rods pointed with platinum, and it is claimed that the points between which the arc forms show practically no wear. The arms are regulated by a simple pendulum arrangement, instead of requiring the complicated feed mechanism of the usual carbon rods. The lamp, which is to be used in a horizontal position, casts no shadow.

A NOVEL AUTOMOBILE OMNIBUS.

A quite new form of electric omnibus has been built by a German firm. This can travel either on rails deriving its motive power from trolley wires or on the ordinary roadway worked by its own motor. When the omnibus runs upon the tracks of an electric line it takes the current necessary to actuate its motors and to charge its accumulators from the feed wire above in the usual way, but when it travels in railless streets the conducting loop and its carrier are lowered, and the current from the accumulators is used. A small truck is arranged in advance of the front wheels, carrying two small flauged truck wheels, which can be raised and lowered and which serve the purpose of guiding the omnibus when running on rails. The brakes consist of one friction brake for the rear wheels and an electric short-circuit brake connected with all four wheels and operated by the same switch handle used in starting the vehicle. The storage battery by which these motors are driven consists of 200 cells.

MOUNTAIN STREAMS TO RUN TRAINS.

The Great Northern Railway is going to try to run some of its trains by means of the motive power supplied by mountain streams. In other words, Mr. J. J. Hill intends to operate that portion of his road from Everett to Leavenworth, in Washington State, by electric motors, doing away with locomotives. The abundant water power now running to waste beside the tracks is to be harnessed to furnish electricity. There are numerous mountain streams, each one being a succession of falls and cataracts, and little work will be necessary to utilize them. The district where this experiment is to be tried is in the Cascade Mountains, and it is claimed that the operation in winter of the electric motors will possess a great advantage over locomotives. It is believed that the overhead trolley will be used. The proposed section of line on which electricity will be introduced is 120 miles long, and includes the big Cascade tunnel now in course of construction.

During 1898-1899 there were 49 institutions offering courses in electrical engineering; 2,397 students took advantages of these courses, of which 370 graduated in 1899.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.

JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

ADDRESS ALL COMMUNICATIONS TO

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PROF. BEDELL'S DISCOVERY.

The American Association for the Advancement of Science is very fortunate in possessing among its members men distinguished for their scientific knowledge and laboratory skill all over the world. Recently Prof. Pupin, a member of the above association, showed experimentally how speech can be transmitted through a submarine cable. Of late Prof. Bedell, of Cornell University, has shown the surprising fact that direct and alternating currents may be sent through the same wire without interference. The interest attached to Prof. Bedell's experiments is very great in consideration of the results obtained, which were almost uniform in character throughout the whole range of tests. He published in connection with his paper a series of tables, supplying enough matter to thoroughly satisfy experts as to the feasibility and practicability of transmitting both currents through the same line. It is most remarkable to realize how a simple experiment of this kind was neither thought of nor attempted by the majority of experimentalists.

An explanation is given by Prof. Bedell in the following language: "Let us suppose that with an original direct current of ten amperes we have an added ampere of alternating current. Half the time this is of the same polarity as the direct current and increases the current density in the conductor; but half the time the alternating current is opposite in polarity to the direct current and during this time makes the total flow of current less and the current density less than for the direct current alone. In other words, the additional ampere of direct current interferes all the time with the original direct current whereas with the experiment reversed the additional ampere of alternating current acts as a detriment for half the time and as an assistance for half the time, these two effects tending to cancel."

The commercial value of a discovery of this nature is very great in cases where the stringing of a transmission line is a difficult undertaking. Although it seems a simple matter to lay two wires, one for direct and one for alternating current, the care of two such lines, as regards the mechanical security and insulation, is frequently a nuisance and at times almost an impossibility. As far as the conductivity of the line is concerned, Prof. Bedell states as follows: "Each current acts as though it had the whole conductor to itself and the other current were absent. Accordingly, the conductors of an alternating current system may be used also as the conductors for the direct current, exactly as though the alternating current did not exist and vice versa."

It seems therefore that a direct saving of copper occurs if a transmission line is used for this double purpose. A saving of this kind, which would amount to thousands of dollars in many cases, is too great to be disregarded. On the other hand, it is equally plain that the use of an alternating current for power transmission, particularly if it is a two-phase current, involves the use of rotary transformers, through the medium of which a high tension direct current is easily obtainable. If a practical system of power transmission can be installed with a copper conductor of such dimensions that a direct saving is effected then towns in the near neighborhood of a power plant could receive over the same line both direct and alternating current and, in the case of the former, save both the trouble and expense of converting it.

THE DESTRUCTIVE EFFECTS OF LIGHTNING.

The severe electrical storms raging over the United States, at about this time of the year, leaving a trail of destruction in their wake, are interesting in relation to the somewhat ghastly character of the injuries caused. The daily papers teem with such reports, some of them being as follows: In the northern part of Bergen County, New Jersey, lightning struck a woman, burnt her nose severely and paralyzed her neck. The paralysis may be fatal as it prevents the unfortunate woman from swallowing food. A farmer entered his barn just as the lightning struck, and during the confusion that followed the cows stampeded and trod him to death. In Mount Vernon, N. Y., lightning rushed down a telegraph pole and either shocked or frightened a policeman who fell to the ground. The shock had burst a large artery in his leg and, according to the reporter, the only thing that saved the man's life was the use of rubber heels. Another case of a woman in a Brooklyn trolley car came to public notice through the burning of the woman's arm by lightning while the car was in motion.

It might be possible to enumerate dozens of other cases in which lightning played its mad pranks, often with fatal results, but the point of greatest interest with such accidents is the fact that our present means of protection are inadequate. It is also to be noticed that where no protective devices at all are used the risk and danger are much greater and the imminent fatality, as in country homes or at the seaside, are something to be feared. Those that live in the city are saved from anxiety on account of the natural protection afforded by the immense amount of metal employed in the framework of buildings and the great number of water and gas pipes which, passing through the houses and connecting with the earth, act as efficiently as lightning protectors. It is quite evident, however, that the destructive effects of lightning to both life and property call for some preventative, the best devices that science affords.

Expositions.

PAN-AMERICAN EXPOSITION NEWS.

The city of Buffalo is soon to have one of the most beautiful buildings in the western world, a public art gallery to cost upwards of $350,000. The building is the gift of J. J. Albright, a citizen of Buffalo and a liberal patron of art, who desires to bestow upon his city a structure that will forever yield immeasurable pleasure to those who visit it, and become, as well, a center of culture and art. The only conditions imposed by the public spirited donor were that the city of Buffalo should furnish a site, and that the Fine Art Academy of Buffalo, which is made the custodian of the property, should raise a maintenance fund of $100,000. The city promptly deeded the site requested, which is just within the limits of Delaware Park, overlooking the beautiful park lake.



The Fine Arts Academy has complied with the terms of the gift as they applied to the maintenance fund, and the building will be hurried to completion as rapidly as conditions will permit. The building will be used as the art palace of the Pan-American Exposition and thereafter become the permanent home of Buffalo's art collections.

This magnificent edifice will be 250 feet long by 150 feet wide, the principal facade looking toward the east. The building will stand upon a broad terrace 35 feet above the level of the park lake, which lies but a few rods below and to the eastward. The principal approach will be by a beautiful monumental flight of steps, the contour of the ground giving opportunity for stately embellishment. The terrace walls are to be of heavy granite blocks. Statuary, fountains, formal floral displays and lawns will complete the ornamentation of the terrace.

The style of architecture chosen is the classic Greek, both the eastern and western facades showing rows of rich, graceful columns. The style is ionic. A semi-circular colonnade forms the central figure of the west or Elmwood avenue front. The building has broad wings at the extreme northern and southern ends, terminated by porches which will be reproductions of famous architectural works of ancient Greece. The highest peak is only 45 feet above ground. The Erechtheum of Athens has been a prolific source of inspiration for the architects, Messrs. Green & Wicks, of Buffalo. The portico of the Erechtheum, famous for its caryatides, will be one of the works to be thus reproduced. The Erechtheum was an ancient temple and is one of the most interesting of the ruins of the Acropolis at Athens. It was rebuilt after the Persian invasion, about 400 B. C.

Entering the building by way of the main approach one comes first to the hall of statuary, in the middle of the building, which is 71x100 feet. Directly west of this is the Hemicycle, a large semi-circlar room with tiers of seats and a rostrum, where lectures may be given before audiences of several hundred people. North of Statuary Hall will be a gallery 35x58 feet. On either side of the corridor leading to this gallery are library and board rooms. Beyond, in the extreme north wing, will be seven studio rooms, connected by a long corridor. In the western part of the building are two ante-rooms and four large galleries. In the large light basement will be numerous other rooms for all sorts of uses in connection with the proper management of the building, such as bicycle and cloak rooms, lavatories, janitor's quarters, electric lighting and heating, packing and storage. The building will be strictly fire-proof, the material being marble steel beams, brick, cement and stone. The structure will require 25,000 cubic feet of marble. All materials will be of the best, so that an enduring edifice may remain when present generations shall have vanished.

ELECTRICITY IN BRITISH CITIES.

A few of the main thoroughfares of London will soon be electrically lighted, some poles having recently been put into position. Piccadilly had a few as long ago as the fall of 1896, and no doubt the success of that experiment is regarded as warranting extension on careful lines.

Birmingham is still a gas-lighted city, and there seems to be no street electric-lighting movement, though on January 1 last the corporation took under its municipal wing the small electric-lighting company. New mains are now being put in, and the question of electric street lighting must come up within a year or two, as must also the question of cost to consumers. Cork is one of the smallest towns with electric service and gets its electricity as cheaply as any city. The charge in Cork is 4½d. (9 cents) per unit for the electricity used in the first two hours every day and 1d. (2 cents) during the succeeding hours. For motor purposes, the charge is 4d. (8 cents) the first two hours and 1d. (2 cents) thereafter. In Birmingham, there is a uniform rate of 7d. (14 cents) per unit to the general run of consumers—that is, to the great number using 100 or less units per month. For any quantity in excess of 100 units, 4½d. (9 cents) is the charge. There is also a special provision of 4d. (8 cents) per unit up to 100 units per month for electrical energy used for motors or all-day loads, and any quantity in excess of 100 units is 2d. (4 cents). A unit means here the burning of seventeen ordinary incandescent lights one hour.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED JULY 31, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

654,583. Machine for Winding and Insulating Electric Coils. J. C. Anderson, Jersey City, N. J.

654,586. Conduit Electric Railway System. F. M. Ashley, New York, N. Y.

654,595. Method of Operating Dynamo Electric Machines. E. J. Berg, Schenectady, N. Y.

654,611. Initiating Device. E. De Moulin, Greenville, Ill.

654,620. Speed Regulator and Brake for Cranes. F. R. Garver, Pittsburg, Pa.

654,625. Signaling Device. J. L. Hall, Schenectady, N. Y.

654,630. Radiophony. H. V. Hayes, Cambridge, Mass.

654,656. Elevator Controller. N. O. Lindstrom, New York, N. Y.

654,658. Electric Railway. G. A. Lyncker, Munich, Germany.

654,663. Electric Regulating Device. W. S. Moody, Schenectady, N. Y.

654,679. Electric Arc Lamp. C. Shuster, Pittsburgh, Pa.

654,693. Electrical Igniter for Hydro-carbon Engines. H. Wegelin, Augsburg, Germany.

654,700. Electric Controller. Wm. Asbury, New York, N. Y.

654,703. Means for Connecting Cables. Nat. Bassett, Philadelphia, Pa.

654,726. Pendulum. F. I. Getty, Chicago, Ill.

654,734. Electric Commutator Cleaner. A. H. Jahn, Homestead, Pa.

654,747. Supervisory Signal for Telephone Switchboards. F. R. McBerty, Downer's Grove, Ill.

654,748. Telephone Toll Apparatus. F. R. McBerty, Downer's Grove, Ill.

654,749. Signal Appliance for Telephone switchboards. F. R. McBerty.

654,750. Switchboard for Telephone Lines. F. R. McBerty.

654,752. Speed-governor Attachment for Electrical Apparatus. J. H. McGurty, Jersey City, N. J.

654,758. Apparatus for Telephone Switchboards. J. J. O'Connell, Chicago, Ill.

654,816. Electrical transmission of power. I. E. Storey, Trenton, N. J.

654,818. Sparking Igniter for Explosive Engines. H. C. Thamsen, Hamburg, Pa.

654,821. Flash-light System. M. Wright, San Antonia, Tex.

654,834. Secret Telegraph Sounder. C. H. Landgraf, Waterloo, Wis.

654,847. Automatic Circuit-breaker. W. M. Scott, Philadelphia, Pa.

654,848. Automatic Magnetic Circuit-breaker. W. M. Scott, Philadelphia, Pa.

654,854. Semaphore Operating Mechanism. J. Shoecraft, Eskridge, Kans.

Business News.

NEW INCORPORATIONS.

Syracuse, N. Y.—The Crouse-Hinds Electric Company has been incorporated with a capital of $10,000. The directors are: H. B. Crouse, J. L. Hinds and J. A. Hopper, of Syracuse.

Troy, N. Y.—The Troy Mantel and Grate Company has been incorporated to manufacture mantels, grates, tile, gas and electric fixtures. Capital, $30,000; directors: George S. Emerson and Harriet A. Emerson, Lansingburg; Charles D. McCarthy, Troy.

Rochester, N. Y.—The Genesee Electric Company, of Rochester, has been chartered to supply electricity for light, heat and power in Rochester. Capital, $50,000; directors: P. H. Flynn, Fred C. Cochon, of Brooklyn, and William A. Boland, of New York city.

New Albion, N. Y.—The Cattaraugus Electric Light and Power Company, of New Albion, Cattaraugus County, has been chartered. Capital, $12,000; directors: A. J. Setter, Collins Centre, and Frank Crawford and H. P. Bishop, Cattaraugus.

Red Bluff, Cal.—The Red Bluff Electric Light and Power Company has filed articles of incorporation. The directors are: Henry A. Gesford, R. S. Masson, H. C. Donnels, P. S. Coke, W. I. Priest, W. F. Wallace and A. R. Kanaga. The capital stock is $125,000, of which $700 has been subscribed.

San Francisco, Cal.—The Fort Miller Power Company has been incorporated to generate and transmit electric power. Principal place of business, San Francisco. Directors: W. Saunders, A. J. Morganstein, T. O. Carter, K. D. McCann, San Francisco, and F. G. Berry, Fresno. Capital stock, $1,000,000, all subscribed.

Saco, Me.—The Reuterdahl Electric Company has been organized at Saco for the purpose of manufacturing, leasing and selling electrical goods, with $100,000 capital stock. The officers are: President, Arvid Reuterdahl, of Providence, R. I.; treasurer, George F. Westtern, of Providence, R .I. Certificate approved July 23, 1900.

Steven's Point, Wis.—The Wisconsin River Telephone Company has been incorporated with a capital of $25,000, 500 shares at $50 each. The incorporators are: F. L. Dille and John Reton, Steven's Point; A. L. Hutchinson, Weyauwega. The company will be co-operative and operate a local exchange in connection with the Wolf River toll line.

New Haven, Ct.—The Franklin Electric Manufacturing Company has filed in the State Secretary's office a certificate of organization. The capital is $10,000, all paid in. The subscribers are the following: Jonathan Camp, Hartford, 34 shares; John Waring, this city, 33 shares, and Charles I. Hills, of Elizabeth, N. J., 33 shares.

San Francisco, Cal.—The Mt. Lassen Power Company has been chartered to generate and dispose of electricity, etc. Principal place of business, San Francisco. Directors: A. Hochheimer, Willows; C. L. Morrill, F. Smith, A. F. Johns, San Francisco; R. M. Saeltzer and H. L. Shannon, Redding, and Park Henshaw, Chico. Capital stock, $1,000,000; subscribed, $70.

Tooele City, Utah.—The Electrical Power Company, organized with a capital of $50,000 in $1 shares, has been incorporated. The purpose of the company is to generate electricity for power and commercial lighting. Joseph C. Orme is president; F. M. Davis, vice-president; A. J. McCuiston, treasurer; Phares Dunyon, secretary, and F. M. Lyman, Jr., George A. Lyman and Charles McBride are the other directors. James M. Gollahar and M. B. Nelson are the remaining incorporators and shareholders.

Fort Wayne, Ind.—At a meeting of the stockholders of the Belden-Larwill Electric and Manufacturing Company, the company was reorganized and the capital stock was increased. Articles of incorporation have been prepared and will be filed soon. By the terms of the new company, the capital stock has been increased The company will prepare to do business on a larger scale. Mr. O. N. Heaton was appointed attorney and the following gentlemen were elected as a board of directors: Messrs. E. H. Belden, O. H. Larwill, S. M. Foster, Abram Weil, C. A. Wilding, George P. Evans and Charles McDougal.

Redlands, Cal.—The California Power Company has been incorporated. The incorporators and directors for the first year are: Henry Fisher, B. O. Johnson, F. P. Morrison, H. H. Sinclair and George B. Ellis. The principal place of business will be Redlands. The capital stock is $2,500,000, divided into 25,000 shares of $100 each, of which $601,000 has already been subscribed. The purpose of the company is to acquire electricity, gas and electric energy by purchase, renting, generating or otherwise, and to supply the same to Los Angeles and other cities in Kern, Riverside, Orange, Los Angeles and San Bernardino counties. The flow of the Kern river, just above Kernville, was recently filed on by members of the company. At that point there is a fall of about 800 feet to the mile, which, it is estimated, will generate 20,000 horse power. F. C. Finkle, with a gang of engineers, is already running the lines for the conduit. The company expects to have the preliminary work done inside of nine months, when work upon the conduit and power house will be begun.

TELEPHONE CALLS.

Sturgeon, Mo.—The New Century Telephone Company has been incorporated to operate a telephone line. Capital, $10,000; incorporators: O. D. Gray, W. Seymour, both of Sturgeon; T. R. Morris, S. P. Hulin, T. D. Sayle, all of Clark.

Otisco, N. Y.—The Otisco & Cedarville Telephone Company, of Otisco, has been incorporated to operate a telephone line from Otisco to Syracuse. Capital, $1,500; directors: H. D. Pomeroy and I. W. Bardwell, Otisco; Lee Cummings, Navarina.

New Augusta, Ind.—The New Augusta Telephone Company, of New Augusta, Marion County, has been incorporated. Capital stock, $10,000; directors: M. J. Wagle, Walter Johnson, W. B. McDonald, John Harcourt, S. I. Rodibaugh and George T. Avery.

Lockport, N. Y.—The Home Telephone Company, of Lockport, has been incorpoated to construct and operate a telephone line connecting the principal points in the County of Niagara. Capital, $125,000; directors: M. B. Butler, Niagara Falls; George H. Frost, Buffalo; A. E. Lord, S. R. Rawson, I. H. Griswold, James A. Drake, F. H. Sudro and F. W. Martin, Elyria, Ohio.

STREET RAILWAY NEWS.

Chester, Pa.—William Bartram, of Lansdowne; Charles Ballinger, of New Jersey; Jno. M. Deal, of Fernwood, have secured a charter under the laws of New Jersey for a company to be known as the American Universal Underground Electric Railway System. The principal office of the company will be at Camden, N. J. The capital stock is made up of 4,000 shares of the par value of $50 each.

Toledo, Ohio.—Articles of incorporation have been filed at Lansing for the Michigan & Ohio Electric Railway, with a capital stock of $200,000, the incorporators being : Washington I. Robinson, W. W. Johnston, J. W. Donovan and Milton Carmichael. This company proposes to build an electric line north from Toledo through Temperance, Ida., and other villages of Monroe County, reaching Dundee, Scofield and Maybee and giving a large territory direct connection with Toledo that now can not reach that market without much difficulty.

Macon, Ill.—The Secretary of State has issued license for the incorporation of the Hervy City & Southern Electric Railroad Company. The company plans the construction of an electric road from Hervy City to Shelbyville. The capital stock of the association is to be $150,000. The principal office of the road is to be located at Macon. The incorporators and members of the first board of directors are: J. Smith Butram, Decatur; Robert B. Hennigh, Prairie Home; Robert H. Woodward, Harold Woodcock and John M. Turner, of Macon.

St. Louis, Mo.—The Elevated Railway Construction Company, an outgrowth of the old Unicycle Elevated Railway Company, has filed articles of incorporation. The company is capitalized at $100,000, and this amount is divided into 10,000 shares, all of which are paid. The stockholders are: J. L. La Prelle, 3,010 shares; Hamilton Daughaday, 454 shares; C. W. Sargent, 227 shares; J. W. Williams, 574 shares; James F. Coyle, 454 shares; John H. French, 244 shares; L. A. Brown, 3,311 shares; Harmon J. Bliss, 227 shares; Dwight Tredway, 818 shares; B. S. Adams, 20 shares; B. F. Nelson, 264 shares; John J. Worsham, 34 shares; C. E. Chapman, 227 shares, and William P. Nelson, 136 shares.



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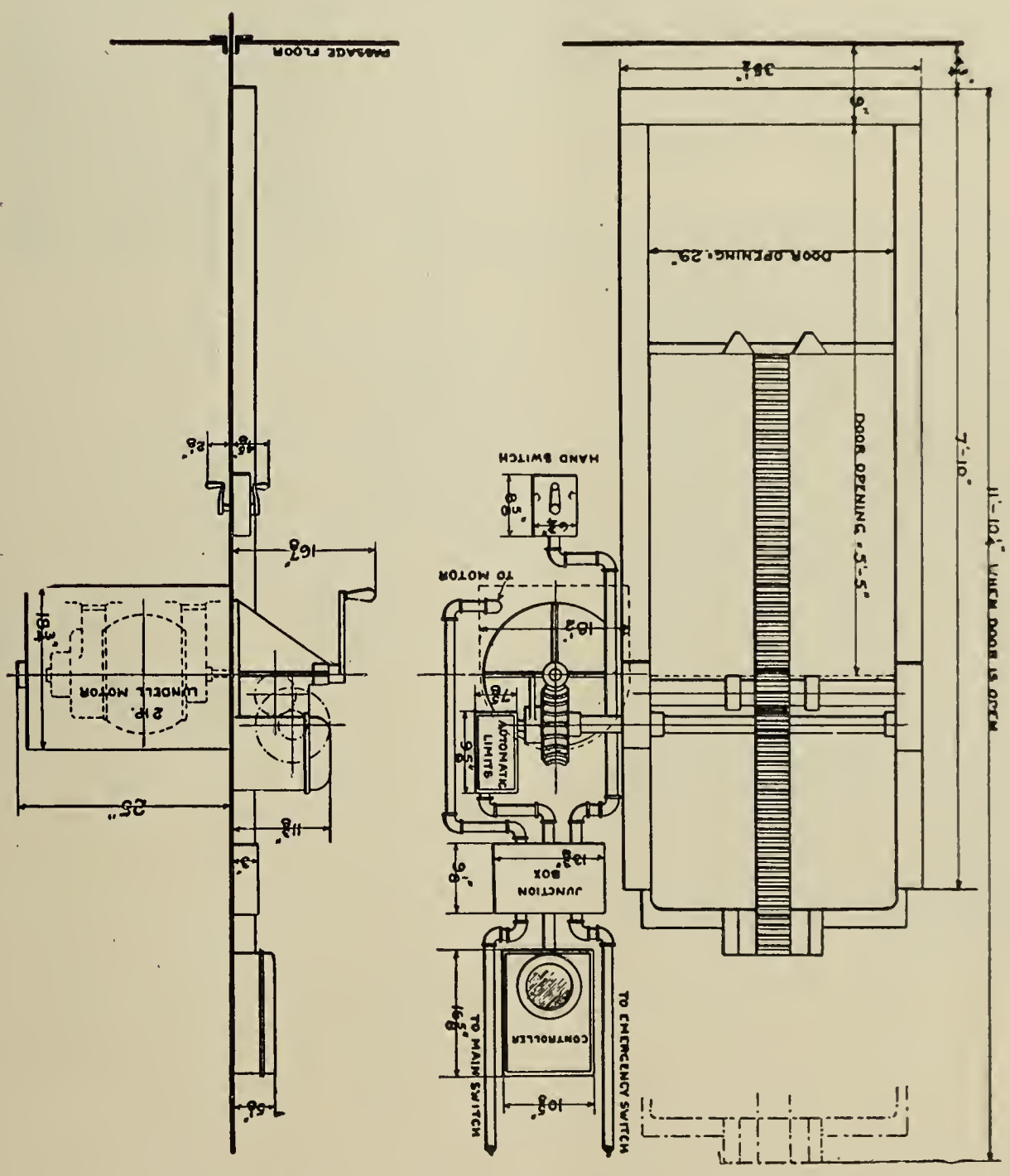
114-120 William Street, Newark, N. J.

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LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 8. NEW YORK, AUGUST 25, 1900. Whole No. 693.

Electric Protective Systems.



Dimensional Plan of Vertical Door No. 2, and Control.

THE SAFETY SYSTEM OF ELECTRIC WATER-TIGHT DOORS.

(Concluded from page 51.)

DESCRIPTION OF THE APPARATUS.

A consideration of the details of construction of the vertical type of door will show that it possesses simplicity, strength, reliability and durability. There are few parts, and no delicate mechanisms. The door and its frame are very rigid, and will not be thrown out of alignment by warping of bulkheads. The door-rim and frame, and all sliding parts and bearings, are bronze. The motor and controlling meachism are enclosed in bronze water-tight cases which protect them from mechanical injury, and from water. The driving mechan-

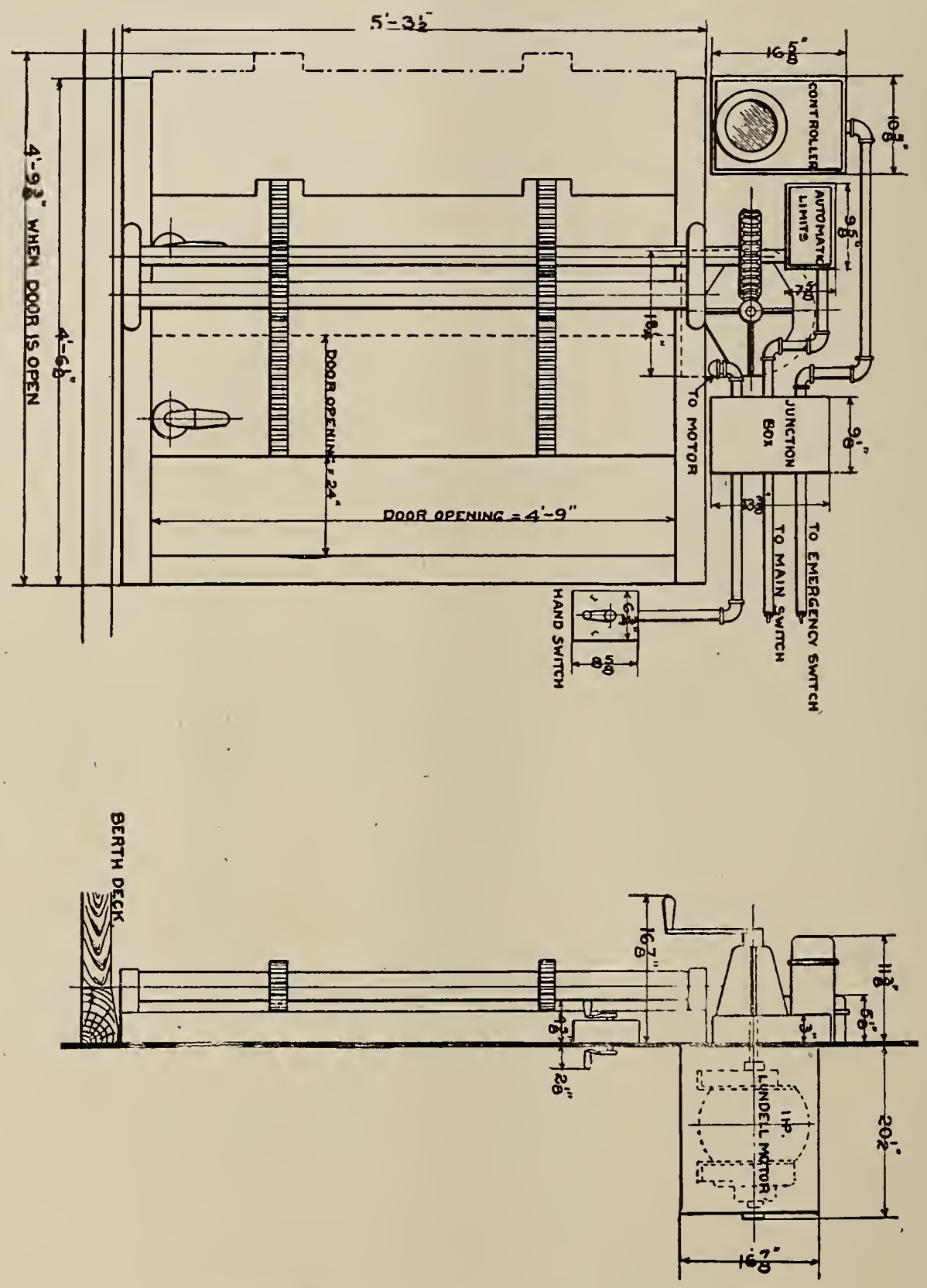
ism occupies but little space, and the controlling apparatus can be so located as to avoid interference with other apparatus.
paratus.

The sliding portion of the door is of steel plate, with bronze rim and rack. The frame is of bronze, which is bolted to the bulkhead. The edge nearest the bulkhead is a plane scraped surface, made water-tight by the action of wedges on the opposite side of the door, which take up in the last one-half inch of travel. These wedges are placed at close intervals along each edge of the door. The door plate carries a bronze rack into which gears a pinion keyed to a horizontal shaft across the guide frame. This pinion shaft is connected through a worm wheel and worm to a shaft extending through the bulkhead, and upon which is mounted the motor armature. For hand operation, cranks are provided which ship over the hexagonal ends of the worm shaft on either side of the bulkhead.

The motor is specially built and wound, so that in ordinary use the power required to raise or lower the door is very small, but when the sill is covered by coal or other obstruction, it is capable of exerting a very powerful effort and will drive the door to its seat.

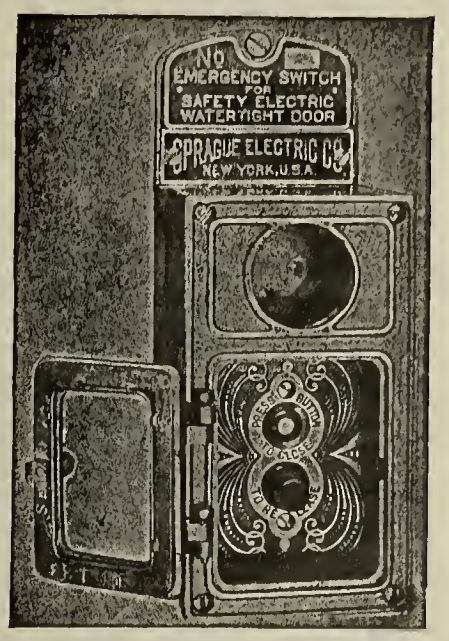
The controlling mechanism includes controller, automatic limit switch, hand switch and emergency switch.

Controller.—This consists of two magnetic switches which govern the circuits of the driving motor. The switches are closed electrically, and are opened by gravity when the current is cut off. One switch controls the upward, and the other the downward motion. The only moving portions of this controller are the solenoid "plungers," which carry solid copper contacts on flexible phosphor-bronze springs. These contacts make up against carbon blocks held in solid studs. All arcing when the motor circuit is broken is taken on these carbon blocks, which, as the carbon wears away from continued use, can be adjusted in their studs. The contact



Dimensional Plan of Horizontal Door No. 1, and Control.

with the carbons is independent of this wear, over wide range, on account of the copper contacts being mounted on flexible springs. There are no pivots or pin joints, and no delicate springs or parts that require skill in adjusting.



Emergency Switch for One Door.

Hand Switch.—This is a three-point switch operated by a shaft that passes through the bulkhead and carries a handle on each side. A movement of the switch handle to the right or left is all that is required to operate the door up or down. As long as the handle is held in one or the other position, the door continues to move. When released it is returned to its central position by a spiral spring and the door is immediately stopped. The contacts are simple and sure, and the handle is made especially heavy to withstand rough usage.

Automatic Limit Switch.—This consists of two arms carried on a shaft which is connected to and driven by the main pinion shaft of the door. These two arms engage with switches which are opened, cutting off current and thus stopping the motor, when the door has reached its extreme upper o lower positions. These arms are adjustable upon their shaft so that the limits of motion of the door can be accurately determined when installed. After being adjusted, no further care is required.

Emergency Switch.—The emergency switch, for closing the door from a distant point, consists of a standard push-button snap switch placed in a suitable case, which also contains the indicator. This is a small incandescent lamp, which, when lit, illuminates the circular glass "bull's eye." All connecting wires from each electric fixture are brought to a central junction box, which forms a central station for connecting the circuits or testing them out. All enclosing boxes are fitted for receiving iron pipe connections.

Trials.—A standard No. 1 vertical door was erected in 1899, for trial tests at the Brooklyn Navy Yard. This was subjected to the most severe tests, extending over long periods, all of which it withstood most successfully. Without a particle of attention or adjustment, the door was operated many times a day for five months, and was closed many times through coal piled over the sill, and through other obstructions. This same door, without any change or repairs whatever, has been sent to the Paris Exposition, at the request of and under the auspices of the U. S. government.

After an exhaustive test and examination by a special commission appointed by the Secretary of the Navy, these doors were recommended for and installed upon the U. S. S. Atlanta, where they are now in service. Installations have been made also on the S. S. St. Paul of the International Navigation Co., and others are in progress and under advisement.

Power.—The power required to operate a single door will depend upon the speed at which it is desired to open or close. The following are power requirements for a No. 1 vertical door arranged to open in 8 seconds and close in 9 seconds:

To start the door down, 13 amperes or 1.43 kilowatts for ½ second.

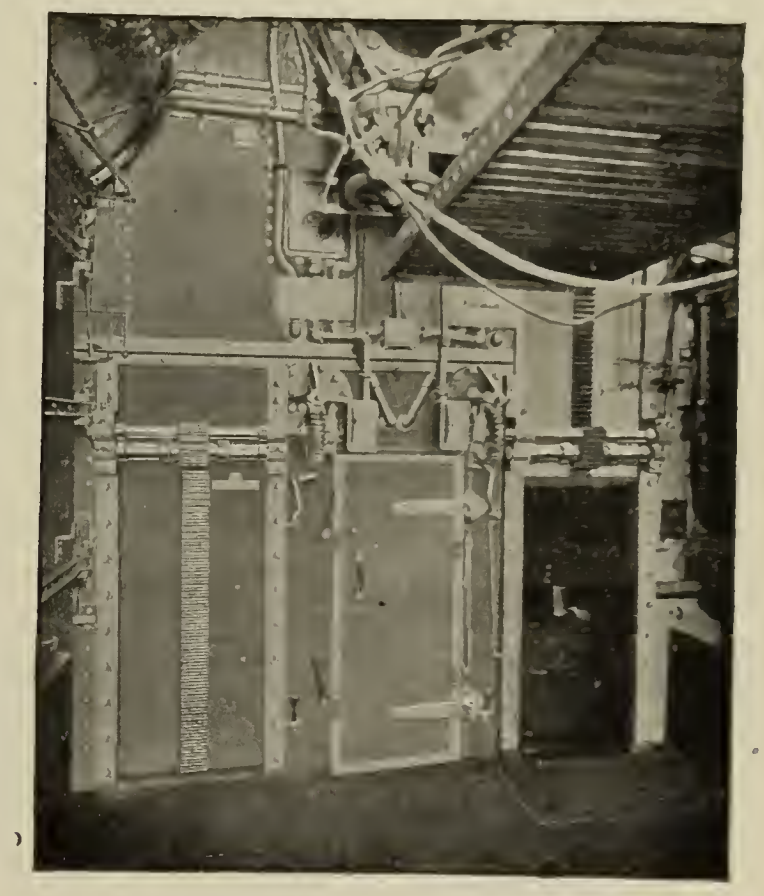
While opening, 8 amperes or .88 kilowatts for 7½ seconds.

All at 110 volts.

To start the door up, 18 amperes or 1.98 kilowatts for ½ second.

While opening, 8 amperes or 88 kilowatts for 7½ seconds.

The instantaneous demand for closing the door at its start is, as per above test, 1.43 kilowatts, for one half second. The total instantaneous demand for a system of doors should not, however, be based on this figure. As the system can be so arranged that one or any number of doors are controlled by a single emergency switch,



Installation on U. S. S. "Atlanta."

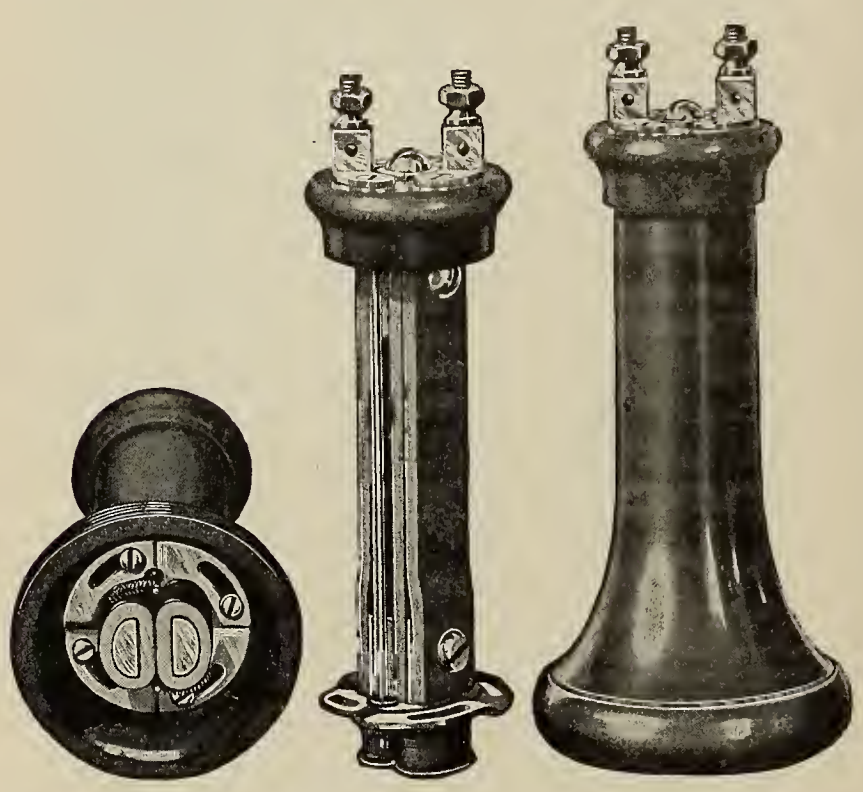
the best grouping for the given conditions is selected and the total power demand at any moment will depend upon the number of doors operated by a single switch. The maximum demand for power at any moment can, by suitable grouping, be made as small as desired.

With a system of 12 doors, in which 3 doors are operated by one emergency switch, making 4 groups and 4 emergency switches, the total instantaneous demand of power would not exceed 7 kilowatts when the emergency switches are closed at the rate of 2 per second, which requires very rapid movement on the part of the operator. This power is required for a period of but one-half second, and the steady total load for 12 doors under these conditions is 3.96 kilowatts for 8 seconds. Since each door must be opened individually by the local door switch, the power demand in opening can never be as great as when closing under emergency conditions. In special cases, where the power supply is so limited as to make it desirable, a special throttling device is provided which automatically and absolutely prevents more than a given rate of power supply to the door system.

Telephony.

A NEW TELEPHONE RECEIVER.

In the illustrations presented herewith are shown views of the new bi-polar telephone receiver, manufactured by the Holtzer-Cabot Electric Company, of Brookline, Mass. One of the interesting features of this receiver is that, although it is of the double pole type, it is constructed with a laminated permanent magnet which has heretofore been found difficut to incorporate in a double pole receiver, although usual in the single pole instruments. The object of the peculiar shape of the pole pieces is that they shall conform to the natural magnetic path and produce a strong, even pull on the diaphram. After a careful study of the magnetic field this construction was arrived at. In order to increase or decrease the distance between diaphragm and pole pieces it is only necessary, after having loosened the four binding



The New Holtzer-Cabot Bi-polar Receiver.

screws shown in the illustration, to rotate the lower tail piece. This will cause the inclined surfaces to engage and the magnetic poles to approach or recede from the diaphragm. After the desired adjustment has been secured the binding screws are again replaced. The cord posts are of a new type and will positively lock the tips of the cords without any possibility of their working loose. Neither is it possible for the posts to change or turn their relative position. A more thorough inspection of this instrument will reveal other features of as great importance as those noted above. The proportioning of the parts, the windings of the spools, the thickness and diameter of the diaphragm and the strength of the permanent magnets have all received the proper attention in the design of this instrument, with the result that a very efficient receiver with an exceptionally clear tone has been produced. Further details of the above will be sent upon request by the manufacturers.

Miscellaneous.

THE INCANDESCENT LAMP AS A CURE FOR ECZEMA.

Prompt cures in certain forms of disease are reported from the use of an incandescent lamp of 16 to 100 candle power. The lamp is provided with a parabolic reflector of proper focus, and connected to a battery or to a street-current supply. The treatment is applied in one or two sittings daily, according to the severity of the pain. The light and heat rays combined very quickly relieve pain, cause hemorrhagic effusions ("black and blue" marks) to be rapidly absorbed, reduce the time of treatment of eczema, and have no equal in cases of acute rheumatism. The appearance of perspiration is a signal to close the sitting. Care is taken to avoid exposure to cold of the treated part.

A NEW DIAMOND SAW.

A diamond circular saw for cutting stone is described in London Engineering, and is said to cut hard sandstone blocks at the rate of five feet per minute. The saw has dovetailed recesses in which are fitted steel blocks, each containing a diamond. A hole is drilled into the block, but stopped before running through. A diamond is dropped into the hole, and a steel wire-peg driven in behind it. The block is then put in an electric welding machine, and when it is softened, pressure is applied until the diamond is firmly gripped and the steel peg is welded into place. The front of the block is then filed away until the diamond is exposed, and the sides are milled to fit the dovetailed recesses in the saw. The positions of the diamonds in the blocks vary, so as to enable the saw to clear itself in making the cut.

SUBSTITUTION OF THE MURPHY THIRD RAIL ELECTRIC SYSTEM FOR THE OVERHEAD CONDUIT ON THE B. & O.

The Baltimore & Ohio Railroad Co. has determined to use what is known as the third-rail electric system as a substitute for its present overhead conduit on the Belt Line section through Baltimore. Since the completion of the Belt Line electrical locomotives have been utilized for hauling both freight and passenger trains from Camden station into the northern suburbs. The current is conveyed by what is known as a Z bar, along which a metallic shoe slides. This shoe is connected by a flexible rod with the electric locomotive. In order to support the current bar a series of arches were required to be built at regular intervals, the system being a sort of overhead trolley on a large scale. It is stated that the system is not as satisfactory as was expected, and hence the decision to substitute something else for it. The Murphy system will be used on about one mile of the Belt Line, which is seven miles in length. On the remainder of the distance what is known as the sectional system will be utilized. This is in operation on the Nantasket Beach division of the New York, New Haven & Hartford Railroad, and is considered a decided success. A third rail for conveying electricity will be laid along the entire line, but in portions it will be located at the side of the track. The electrical locomotives at present in service will be used in connection with the new system, the current being taken from the bottom of the locomotive instead of the top, as at present. The contact will be made by means of a sliding shoe, as at present, and the overhead-arch system and wiring will be removed. It is calculated that the work of remodeling will occupy but a short time. It will begin about August 15.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.
JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

ADDRESS ALL COMMUNICATIONS TO
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EARNINGS FROM MODERN INDUSTRIES.

Within the last century, through the influence of scientific discoveries which crystallized into important industries, the earning capacity of individuals has greatly increased. It would be a simple matter to point to some of the greatest existing industries and trace their origin to a period not at all remote. By processes of co-operation and co-ordination development of small cncerns along business lines has attained gigantic proportions and as a result the civilized world has been put into possession of more benefits and household comforts. In reviewing the industrial situation as it appears at present the immense earnings of companies directly allied or related to our own profession indicates a degree of prosperity dependent upon first, the unusual demand for manufactured goods; second, the care exercised in the business management. The two well known corporations, both Westinghouse and General Electric, paid out in dividends a sum aggregating one and a quarter million dollars within the last month. This fortune, which is disbursed at stated intervals, testifies to the growth and future in but two isolated cases of electrical manufacturing interests. The belief which prevailed this summer regarding the business outlook was totally unfounded and, in fact, seems to have been spread either through a desire to depress the legitimate value of securities or through a panicky fear of a somewhat hysterical character. With the demand for electric lighting steadily increasing as well as for appliances for power and traction there is little to fear for many months and possibly years in this direction.

The consumption of copper is one of the instances and proofs of the influence of a growing industry upon the price of a natural product. On the other hand, improvements in the art of copper refining have led to the absorption of large mining interests by long-headed capitalists who saw future possibilities in that industry, leading on their part to a control of the entire output. The Calumet and Hecla mines, which produce immense quantities of copper as well as gold and silver, recently paid out one million dollars in dividends. The Amalgamated Copper Company one million and a half. In the mining and refining of copper through the aid of electrolytic methods changes have been instituted which enable mine owners to work with a much larger proportion of profit than heretofore. The metallurgical works which now comprise an essential part of every large copper plant plate over the pure metal to the cathode, allowing the dross to fall to the bottom of the vat. This dross contains enough gold and silver, which is now extracted, to pay in total the expense of operating the plant. The copper, therefor, is practically pure profit and, in consequence, stock in copper companies operated in a modern manner has risen wonderfully in the last few years. With the increasing consumtion of copper there is a possibility of the price of this metal rising still higher. But whatever may be the case copper mining is now so dovetailed with electrical processes of refining that it seems as though a dividend cannot be paid by mines otherwise operated.

In addition to the consumption of copper builders of electrical machinery call heavily upon the steel manufacturers for metal. It might almost be said that machine works turning out high and low speed engines are included under the same head. The manufacturers of steel and iron have within the last few years had exceptional opportunities, in an industrial sense, of establishing themselves upon a solid basis. Although but a percentage of the steel consumed is devoted to the construction of generators still it represents a growing factor which may some day assume proportions hitherto undreamed of. Various large steel companies have declared dividends which indicate unusual prosperity. A general total would approximate five million dollars, which would include the earnings of such corporations as the American Steel & Wire Company, Federal Steel Company, the Bethlehem Steel Company and the Republic Iron & Steel Company. These princely earnings possess a greater importance in the eyes of thinking people than might be at first supposed. It has been stated by one of the world's financiers that the demand for steel and iron is an excellent indication of the demand for other things. These figures cannot be attributed to orders placed for subsequent delivery. They represent, and a slight calculation would readily show, transactions exceeding one hundred million dollars within the last few months and entirely in relation to steel and iron. The United States has taken its first deep breath of the air of industrial prosperity. With every expectation of greater demands and possibilities for raw and manufactured articles political economists can legitimately enthuse over prospects that the least optimistic would consider well on the way to fulfillment.

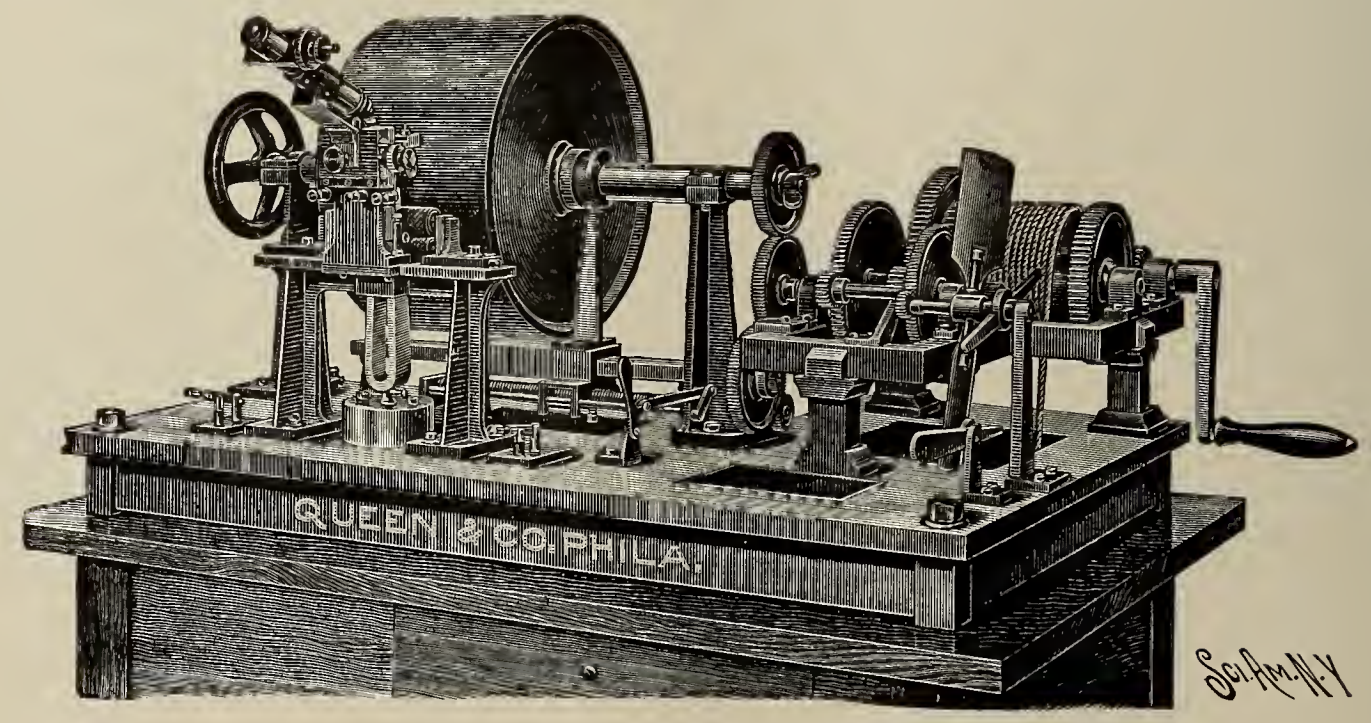
Although the demand for copper in a wrought and cast form has been greatly on the increase, due to the advancement of electrical enterprises, the supply in the form of wire is entirely devoted to electrical purposes. With the laying of new submarine cables, the installation of new electric roads all over the country, and the demand for copper wire for telegraphic and telephonic instruments, it seems as though the day were not far off when other metals might come into play to serve the purpose of conductors. The advantages of aluminim will always be in evidence when that critical time arrives

in the history of the copper trade. But the general use of aluminum will be limited unless the supply of copper is insufficient. Lightness has many advantages in the laying of conductors but the increased bulk all but removes this. By manipulation and cornering copper will rise in price. The aluminum interests will then advance in the field of electrical activity but the check will always be in the hands of those in control of the copper situation.

Electrical Measuring Instruments.

THE CHRONOSCOPE.

The chronoscope, as its name indicates, is a time measurer, but the intervals it measures are exceedingly small. The chronoscope is interesting to the naval and military authorities because of its use for measuring the speed of projectiles. It consists essentially of a cylinder or drum on the surface of which is a coating of lamp black. This drum is rotated by clockwork once a second and at the same time caused to advance in the direction of its axis. A tuning fork is mounted in front of the drum and a light stylus, attached to one leg of the tuning fork, is so placed as to trace a line on the surface of the drum when set into motion by the vibration of the tuning fark. One rotation of the drum with the fork drum. The secondary of the coil has one terminal grounded on the chronoscope; the other attached to a fine point placed near the drum. The spark jumps in the secondary coil from the points to the rotating surface of the drum and leaves a mark on the lamp black. The repetition of this, as the drum rotates, enables marks to be examined whose distance apart determines the interval which elapsed. The Queen-Schultz chronoscope is an adaptation of the device invented by Captain Schultz, of France. It is manufactured by Queen & Company, Incorporated, of Philadelphia, Pa., the well known makers of electrical and scientific instruments.



vibrating would cause a record to be made of two hundred and fifty vibrations. The tuning fork is constructed so as to produce this limited number of vibrations. In addition to these attachments is a telescope with micrometer attached. Each vibration of the tuning fork can thereby be examined minutely so that each vibration representing a curve can be further subdivided into one thousand parts

From the guns' bore a series of circuit breakers connected wth this device and every half second a circuit is closed through which a pointer attached to a leg of the tuning fork makes a mark on the drum. To test the speed of projectiles electrical contacts are made in the bore of the gun and a circuit breaker attached on these points which are situated about a foot apart. The current is interrupted through the movement of the projectile past the circuit breaker. Through the aid of an induction coil, to the primary of which the circuit breakers are attached, an inscription can be traced on the

EVENING TECHNICAL COURSES AT PRATT INSTITUTE, BROOKLYN, N. Y.

Classes in physics, chemistry, applied electricity, mechanical drawing, mechanism, steam and the steam engine and strength of materials, for the benefit of those unable to attend the day courses have been established at the above well known institution. The aim of the evening courses is, so far as the limited time allows, to furnish a thorough and practical training in the various branches which will be of immediate value to the student, not only by increasing his general information, but also by enabling him to advance himself to positions of greater responsibility in his special line of work. By attending in succession several courses a fairly complete mechanical or electrical course may be obtained. The theoretical instruction in every case is supplemented each session by individual practice in the laboratories or drawing rooms, and all of the expensive apparatus and extensive laboratories of this department of the institute are available for these classes, and the outfit lent each student lacks nothing needed for the most thorough individual work. All classes meet on Monday, Wednesday and Friday, from 7.30 to 9.30 p. m.

An entrance examination in arithmetic and algebra through simple equations is required for admission to this course in applied electricity, and one in arithmetic for the course in steam and the steam engine. Those having taken the course in physics will be given the preference in admission to all other courses. Application blanks and all necessary information may be obtained, by letter or in person, at the office of the institute, Ryerson street, between DeKalb and Willoughby avnues.

Expositions.

"DARKNESS AND DAWN."

"Darkness and Dawn," which is to be one of the features of the Midway at the Pan-American Exposition in Buffalo next year, is a presentation of Dante's Inferno. It is remarkably realistic, with enough of comedy to relieve the gruesomeness that otherwise might jar sensitive natures. The visitor is taken in hand by guides and conducted to an elevator by which he seems to go down, down into hopeless darkness. As he steps from the cage he finds himself in a cool retreat with jovial companions, such as a living skeleton, a widow in her weeds, an undertaker or two. It is the threshold of the place which good people expect to avoid in the hereafter. The visitor, under the protection of guides, is assured of



safety. He is led through a series of corridors and grottos, along burning lakes and other devices of torture, where he may witness the punishment of those who juggle with the truth, who borrow umbrellas and neglect to return them, who gossip about their neighbors and who otherwise trespass on the rights of others. The lesson is a salutary one. Presently the scenes of purgatory are passed and the visitor comes to the "Grotto of Dawn," where maidens are dancing and singing and wonderful illusions greet the eye. The music and brilliant scenes form a happy ending of the journey. After tarrying a few moments in the grotto the visitor returns once more to the realm of every-day life.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.

PATENTS ISSUED AUGUST 7, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

655,176.—Electric arc lamp. J. F. Ackermann, New York, N. Y.

655,203.—Telegraphic transmitter and receiver. A. C. Crehore, Fort Monroe, Va.

655,216.—Switch for suspended electric conductors. J. Floyd, Washington, D. C.

655,217.—Crossing for suspended electric conductors. J. Floyd, Washington, D. C.

655,219.—System of electrical distribution. E. E. Frischmuth, Berlin, Germany.

655,237.—Apparatus for transforming alternating currents into continuous currents and vice versa. M. Hutin, Paris, France.

655,238.—Process of transforming alternating currents into continuous currents and vice versa. M. Hutin, Paris, France.

655,239.—Process of bleaching by electrolytic chlorin water. T. Jespersen, Neenah, Wis.

655,243.—Fuse-block. L. A. Keith, Mansfield, Ohio.

655,249.—Telegraphic typewriter. R. Kubler, Berlin, Germany.

655,265.—Electric cable. G. H. Nisbett, Huyton, England.

655,266.—Electric arc lamp. J. S. Nowatny, Madisonville, Ohio.

655,268.—Electric motor. E. G. P. Oelschlager, Charlottenberg, Germany.

655,276.—Measuring instrument. F. Schrottke, Berlin, Germany.

655,289.—Igniter for explosive engines. L. Witry, Waterloo, Iowa.

655,317.—Electric temperature-indicator. L. S. Wilder, Springfield, Mass.

655,335.—Motor-starter. E. M. Fraser, San Francisco, Cal.

55,336.—Controller. E. M. Fraser, San Francisco, Cal.

655,340.—Starting device for electric motors. J. H. Gorges, Berlin, Germany.

655,341.—System of alternating-current transmission. J. H. Gorges, Berlin, Germany.

655,343.—Electrolytic cell. J. Hargreaves, Widnes, England.

655,344.—Cathode for use in electrolytic cells. J. Hargreaves, Widnes, England.

655,353.—Meter. C. O. F. Schrottke, Berlin, Germany.

655,368.—Electrical battery. C. E. O'Keenan, Paris, France.

655,389.—Safety device for electric vehicles. F. E. Case, Schenectday, N. Y.

655,406.—Electric sparker for gasolene engines. J. G. MacPherson, Philadelphia, Pa.

655,411.—Electrical detector for heat or cold. J. O'Meara, New York, N. Y.

655,412.—Circuit-closer. J. O'Meara, New York, N.Y.

655,413.—Magnetic drinking cup. H. A. Parkyn, Chicago, Ill.

655,427.—Burglar or fire alarm. F. D. Wallace, Wheatland, Ind.

655,433.—Magnetic separator. C. F. Courtney, Broken Hill, N. S. W.

655,455.—Electric railway. W. P. Purvis, Philadelphia, Pa.

655,476.—Electric lock. H. G. Carleton, New York, N. Y.

655,491.—Electrically-driven machine. T. H. Joseph, New York, N. Y.

655,520.—Marine velocimeter. P. Schultze, Berlin, Germany.

655,562.—Brake for electric motors. C. A. Lindstrom, Chicago, Ill.

655,563.—Electric carriage. C. A. Lindstrom, Chicago, Ill.

655,620.—Telephonic apparatus. A. Graham, London, England.

655,651.—Multiplex telephony. E. A. Faller, San Francisco, Cal.

655,671.—Electric conductor for exercising apparatus. A. M. Crooker, Boston, Mass.

Business News.

NEW INCORPORATIONS.

Bath, N. Y.—The Bath Electric and Gaslight Company, of Bath, has been incorporated. Capital, $100,000; directors: N. W. Dalton, M. A. Dalton and J. F. Parkhurst, Bath.

New York City.—The Ideal Electric Contracting Company, of New York city, has been chartered to deal in electrical appliances. Capital, $1,000; incorporators: H. Nekritz, W. E. McKeen, A. Hirshfeld, all of New York city; B. Ginsburg, attorney, New York city.

TELEPHONE CALLS.

Philanthropy, Ohio.—The Butler County Western Telephone Company, of Philanthropy, has been chartered to conduct a telephone system. Capital, $5,000; incorporators: J. Moorhead, C. Conn, W. S. Beard, S. E. Fue, J. F. Gillespie, W. A. Beard, R. D. Gillespie.

Thompson, Pa.—The Northeastern Pennsylvania Telephone Company, of the Borough of Thompson, Susquehanna County, was chartered at the State Department, at Harrisburg, recently, with a capital of $10,000, to construct telephone lines in the counties of Susquehanna, Wayne and Lackawanna.

STREET RAILWAY NEWS.

New York City.—The Herkimer Construction and Improvement Company, of New York city, has been incorporated to construct and equip railroads and telegraph and public works. Capital, $10,000; directors: Robert Earl, second, Herkimer; Louis W. Stolesbury and Thomas E. O'Shea, New York city.

Norwood, Mass.—The directors of the Norwood, Canton & Sharon Street Railway Company have filed a notice with the commissioner of corporations announcing that half of the capital stock of the road, $67,500, has been paid in cash. William Otis Faxon is president and J. F. Perry is treasurer.

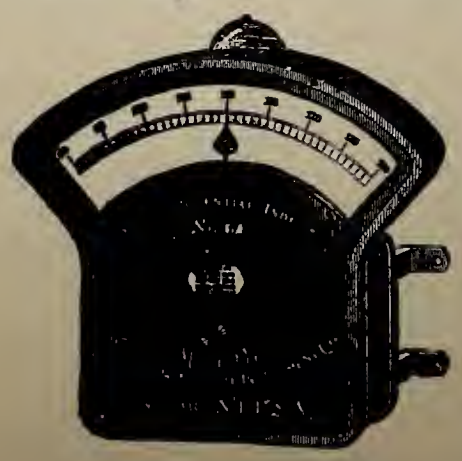
Dayton, Ohio.—The Dayton, New Carlisle & St. Paris Traction Company, of Dayton, has been incorporated with a capital stock of $1,350,000. The incorporators are: B. H. Rannells, H. S. Forgy, Charles E. Layton, Harrie N. Reynolds and John A. Broke. The company proposes to construct and operate an electric road from Dayton to New Carlisle and from Dayton to St. Paris, passing through the counties of Montgomery, Miami, Clark and Champaign.

CORPORATION CHANGES.

Ansonia, Ct.—The Connecticut Insulating Wire Company, of Ansonia, has increased its capital from $5,000 to $7,000, of which increase $1,000 has been paid in.

St. Louis, Mo.—At a meeting of the stockholders of the Laclede Power Company it was voted to increase the capital stock of the company to $800,000. The company has heretofore secured its power from the Laclede Gas Company, but it has decided to erect its own power plant, and the additional money was needed for this purpose.

WESTON STANDARD ILLUMINATED DIAL STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

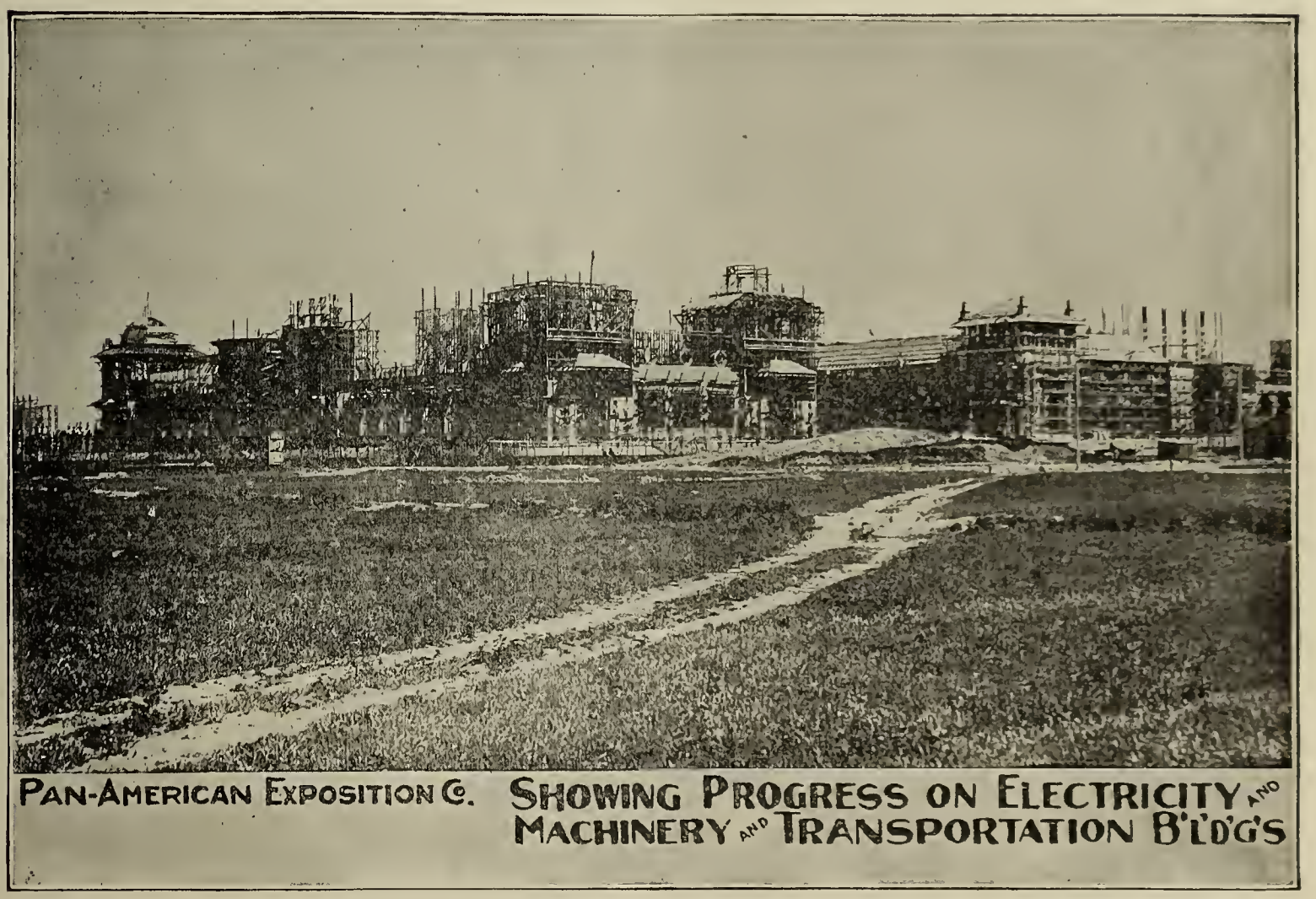
114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 9. NEW YORK, SEPTEMBER 1, 1900. Whole No. 694.

Expositions.



PROGRESS OF THE PAN-AMERICAN EXPOSITION AT BUFFALO.

The accompanying views give some idea of the progress of work upon the buildings for the Pan-American Exposition to be held in Buffalo next year. One of these shows the Electricity and Machinery building, looking southeast from that portion of the grounds which will be occupied by the Midway. The view does not clearly distinguish between the two buildings, but they are in reality separated by one of the main thoroughfares of the Exposition known as the Mall, 150 feet wide, which runs east and west. The other shows a nearer view of the Electricity Building looking up at the southeast corner. The point of view is near the base of the Electric Tower, the first lengths of the steel frame work of which are now being put in place and which will ultimately reach skyward 375 feet.

All of the large buildings of the Exposition are well under way. These include, besides those here represented, the Agriculture Building, Manufactures and Liberal Arts Building, Graphic Arts, Forestry and Mines, Horticulture, the large group of three Government buildings, Temple of Music, Ethnology Building, Stadium, Midway, New York State Building and the Albright Gallery of Art. The Service Building, which is the administrative headquarters of the Exposition, was completed early last fall.

By reference to the illustrations here given it will be seen that workmen are already putting on the gleaming white staff with which all the buildings are to be covered. The staff is prepared in an endless variety of forms including elaborate statuary, large cartouches and medallions, rich columns, consoles and brackets, soffits and pilasters in relief, and all sorts of architectural ornaments of intricate detail. All the exteriors of the buildings are to be finished in color, presenting a most agreeable effect upon the eye. It is said of this Exposition that it will surpass all former expositions in the extent and variety of its sculpture and plactic decoration. It will lumination of all surrounding objects by the use of more than 200,000 electric lamps.

The installation of the heavier exhibits is to begin early in November and the contracts require that all of the principal buildings shall be completed before severe weather sets in. Thus is the public assured that the Exposition will be opened on time and that the early comer will have quite as much to see as those who delay their visit.

The process of building a great Exposition has a charm to every one who has an interest in the development of any grand enterprise. It represents a vast or-



PAN-AMERICAN EXPOSITION Co. VIEW NORTH-WEST FROM FORE COURT
FROM PHOTOGRAPH TAKEN AUGUST 1st 1900.

also outrival its predecessors in the beauty and completeness of its horticultural and floral effects, and is to have the most elaborate and picturesque presentation of electrical effects ever undertaken. The arrangement of the buildings is a symmetrical one, nearly all of the principal structures being grouped about broad courts. About 33 acres of land are comprised in these courts, all of which will receive this elaborate embellishment. Large pools with a bewildering number of fountains and jets of water will complete the picture and at night the rippling surfaces of water will be made particularly brilliant by means of floating lights and the wonderful illganization, with its director-general and assistant directors, superintendents, contractors, care-takers, foremen and an army of workmen under the discipline necessary to carry on rapidly and successfully a great work. Materials are being brought into the grounds by train loads almost every day, and each week shows definite progress. The illustrations here given show what has been accomplished on the buildings in about three months. Another three months will find several of them completed and all of them so well progressed that the rigorous weather of winter cannot interfere with their prompt completion.

Miscellaneous.

USING ELECTRICITY IN FRENCH MILLS.

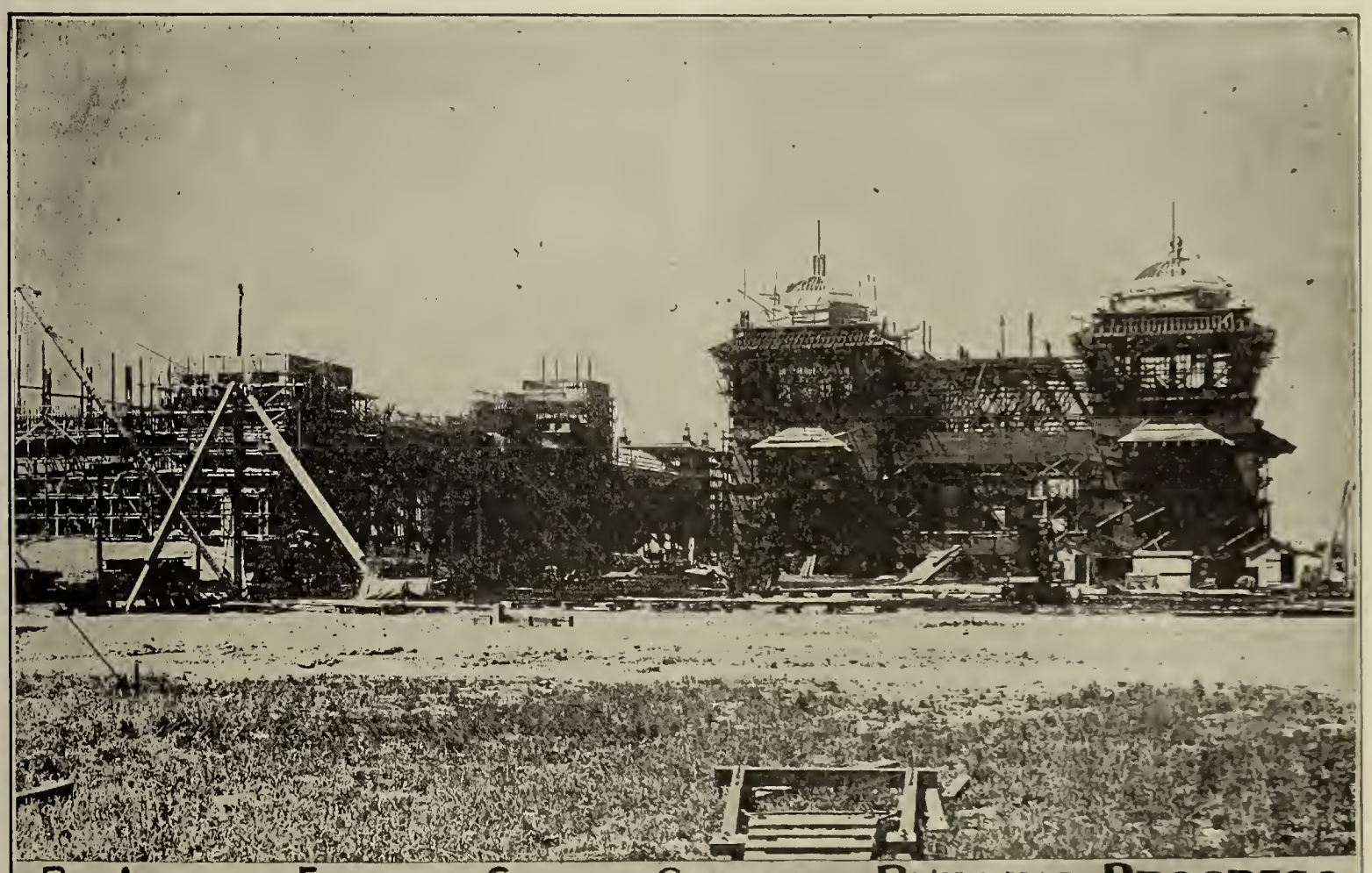
Electricity as a motive power for looms has made much progress in St. Etienne, where there are at present 2,380 weaving shops employing electricity and running 5,369 ribbon looms. These looms were formerly worked by hand, and the amount of strength needed to operate them made this work one exclusively for men. With the motive power, however, lighter female labor can be employed, and the result in the future will be the substitution of female labor in a field in which male labor has heretofore had no competition.

ELECTRIC CRANES IN THE HARBOR OF HAMBURG.

The electrical cranes in Hamburg Harbor serve principally a portion of the new wharves leased to the Hamburg-American Line. They are operated by the employees of this steamship company. The State, which owns the cranes, also owns the central station and furnishes current to the users of the cranes. The method of mounting the normal harbor crane, which has proved very satisfactory in Hamburg, consists of a bridge, or gantry, spanning the railway track and supported at one end by a rail running along the warehouse wall, while its other end is movable on a rail laid along the edge of the quay.

Early in the nineties electric cranes were tried and practically abandoned, for here, as elsewhere, electric apparatus seemed to be comparatively late in adjusting itself to the practical requirements. The high speed of the motors, the mistake of trying to perform all movements with one motor instead of having a motor for each movement, the unprotected design of the motors themselves, and the clumsiness and fragility of the regulating apparatus were troubles just serious enough to outweigh the recognized advantages of electric power distribution. The ironclad, waterproof, low-speed, continuous-current series motor, and that "liberally applied" (a motor for each movement), seemed to be the key to the final solution. It is the result of street railway and mining locomotive practice and was adapted from America.

The modern controller, likewise developed in street railway practice, is the second element in the success of the electric cranes. Where two motors are used, their controller may be mechanically combined through a universal joint and manipulated with one handle. This arrangement applied to hundreds of cranes has proved most efficient for the cranes in Hamburg. The hoisting and turning motors are under one hand. The load follows, in direction, the movement of the handle. Pressing down the handle lowers the load, for it operates only one controller, leaving the other at the zero point. By turning the handle horizontally, the other controller is operated, and the crane swings about. A diagonal movement combines these motions, and both motors then work together with any desired ratio of speed. It is at once evident that the motorman is relieved by this simple arrangement from the necessity of the close attention which two sets of handles would require, and his whole attention is confined to a nice placing of his load and a time-saving combination of hoisting and slewing. The experience with cranes and hoists on Lloyd liners, which are served by local dockmen, quite established these "universal controllers" as indispensable parts of the plant. Neapolitans, Malayans and Chinamen soon felt as much at home with the controller handle as they had formerly with the steam winches.—Louis J. Magee, in Cassier's Magazine.



PAN-AMERICAN EXPOSITION CO. SHOWING BUILDING PROGRESS.

FROM PHOTOGRAPH TAKEN AUGUST 1ST 1900.

The Incandescent Lamp.

INCANDESCENT LAMPS.*

BY FRANCIS W. WILLCOX.

The commercial incandescent lamp is now in its twentieth year. In this short period it has grown from a weakling to a giant of industry. The value of the manufacturing lamp business of the United States alone aggregates over $2,000,000, with a total production of between 15,000,000 and 20,000,000 lamps per year, and European factories will swell this total output to over 25,000,000 per year.

Assuming the value of a lamp at 20 cents, we have an annual expenditure of between $4,500,000 and $5,000,000, paid for this one detail of electric lighting—certainly a significant index of the great value of the electric industry.

Although an apparently small detail of electric lighting, the incandescent lamp is the most important part of the system.

Some one has well said that the incandescent lamp is the very soul, the essence of electric lighting, and it is an evident fact that electric lighting cannot improve any faster than the art of lamp manufacture permits.

Electric lighting waited for the production by Edison of a successful incandescent lamp. The improvements in electric machinery and methods of distribution, the refined results obtainable to-day, have caused more dependence than ever to be placed upon the incandescent lamp, and have accentuated the need and the importance of the most superior quality of lamp to secure the best results.

The selling price of good lamps has been brought down from $1 apiece to an average of 18 cents. This immense reduction alone would be a great achievement were it not rendered still greater by the great improvement in quality of the product. Measured by the standard of the best lamp of to-day, sold for an average price of 18 cents, the lamps that sold formerly for $1 would be very costly as a gift to any central station.

As we glance back over the field of development we find many features of interest, and I propose this evening to describe a few of the more important and interesting features in detail, such, for example, as:

The improvements in lamp manufacture.

The advance in quality and change in types and standards of lamps, and the improvements in method of supply.

The widened filed of lamp use, and the production of special types and forms for special service.

The advance in methods of lamp testing.

The better understanding on the part of purchasers of the essentials of a lamp and of its correct use.

IMPROVEMENTS IN LAMP MANUFACTURE.

The production of a lamp involves many operations, but the real essentials are four in number: Making the filament; treating or "flashing" the filament; joining the filament to the conducting connections; and exhausting the lamp. The remaining processes, such as sealing in bulbs, capping, etc., are mechanical and simple.

The early struggles with platinum, silk, tamadine and various natural fibers, down to the selection by Edison of Japanese bamboo, are well known. The old bamboo filament had many disadvantages. The natural bamboo could not always be obtained of uniform density and character. The filaments were limited in length. The production of the filament by the cutting and shaving of the bamboo sticks involved a large amount of labor and waste of material.

*Read before the Franklin Institute.

We now beat nature at her own game. We make a fiber any legth , size or shape, and we make it uniform. We mould cotton into a filament as the brickmaker makes his bricks, by making a solution, moulding (i. e., squirting it) into desired shape, then drying out the solvent and baking it.

With the old bamboo filament the Edison factory, for a production of 20,000 lamps per day, employed 350 people cutting fiber. With twice this production of lamps, i. e., 40,000 per day, but twenty-five people are necessary to produce the squirted filaments. With the bamboo over 90 per cent. of the crude material was wasted; with the squirt filament over 95 per cent. is utilized.

The treatment or flashing of filaments has always been rightly considered a most marked improvement in lamp manufacture.

As is well known, all lamp filaments, after carbonization, are subjected to a treating or depositing process. This deposition is accomplished by burning the filament at high incandescence in a chamber in the presence of gasoline vapor. The white-hot filament decomposes the gasoline vapor, depositing a surface coating of graphitic carbon over the filament. It is of interest to note that the reasons for its adoption no longer apply, and that it is retained to-day for other purposes. The early filaments were all untreated.

It was impossible then to make filaments uniform and free from uneven sections or points, and it was very difficult to cut the filaments to a given resistance. The treating process was devised to overcome these diculties. By filling in the uneven points with the carbon deposit the filament was rendered uniform. The gradual increase of diameter through the carbon deposit allowed the resistance to be decreased to any fixed amount, readily and accurately.

The present cellulose filaments are made both uniform and of the desired resistance, so that treatment is not now necessary for these results. Why, then, is treatment still continued? Because it gives a hard, dense surface coating of graphtiic carbon, which is more durable than the filament base of amorphous carbon, and also because it effects an increase in the emissivity of the filament. Consider the case of two filaments, one treated, the other untreated, and both consuming the same current. The surface coating of the treated carbon acts to retain the heat, which is radiated more rapidly from the untreated surface of the other. This results in raising the temperature of the treated filament above the untreated, and giving a higher candle-power. This means an increase in efficiency, since it is evident that to give the same candle-power less power would be required by the treated filament.

The early methods of treatment required that a filament be treated by steps, i. e., treat a few seconds, then take out and measure, and so on until the desired resistance was obtained. How crude this seems compared to the present automatic Wheatstone bridge arrangement, which instantly arrests treatment when the desired resistance is reached.

This arrangement alone has reduced the employes to one-quarter of the number formerly necessary.

The progress in the art of joining filament to connections is clearly shown from an examination of old and present lamps. We trace it through from the early bolt and nut clamp of Maxim, the electro-plated joint of Edison, down to the modern paste and deposited joints —a marked advance toward simplicity and lessened cost.

In the exhaustion of lamps, manufacturing methods were for a long time slow of improvement. What was needed was a rapid and effective method of pumping that

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.
JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

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THE INCREASE IN EXPORTS OF ELECTRICAL MACHINERY.

The conditions that govern the output of factories are, in a sense, identified with those that exercise a tremendous influence over a nation's prosperity. The position the United States has assumed as an exporter of manufactured goods is less surprising than natural, considering the facilities at our command and the native power of invention possessed by many Americans. Aside from these facts the exports of machinery from American ports have steadily increased until to-day it seems as though European nations would find emanating from this country a species of competition impossible to meet.

In the organ representing the National Association of Manufacturers the following paragraph appears: "In one hundred years this country has imported $31,526,824,646 worth of merchandise and has exported $33,573,412,658 worth of our own products, leaving a balance of $2,046,588,012 in our favor on the century's trade. With only three exceptions the balance of international trade has been in our favor for the past twenty-five years. During the year just ended, with imports of $849,714,670 and exports of $1,394,186,371, the balance to our credit was $544,471,701, equal to our total exports twenty-five years ago."

With special reference to exports of electrical machinery reports show a rapid increase in the rate at which foreign countries are buying up American machines. In 1900, during the fiscal year, $3,834,317 worth of electrical machinery was exported. In 1899 only $2,517,707 worth was exported and in 1898 about $1,833,707 worth. In other words, since 1898 the exports in electrical machinery have doubled and all indications point to an increase during the coming years. The bulk trade included the export of telegraph and telephone apparatus and electrical apparatus used for scientific purposes, in contradistinction to that employed for lighting and power. In 1898 $2,521,288 worth was exported, in 1899 $3,929,073 worth and in 1900 $5,876,618 worth. The aggregate exports of electrical apparatus and instruments approximated $9,000,000 during the fiscal year of 1900. This in itself is an extraordinary showing and speaks well for the progressive spirit, earnest efforts and remarkable inventive power possessed by our manufacturers.

The old law that operates in the organic is manifested here as well. The survival of the fittest, the ability to manufacture cheaper and better goods than competitors and the faculty, through the aid of improved machinery, of filling orders in the shortest possible space of time, these are the facts that testify strongly in favor of the superiority of the American manufacturer. With the advantages that Europe possesses, or rather has possessed, in the way of educational institutions and savants and inventors it is strange indeed that the younger country, thousands of miles away, isolated as it were from the mother world, should so far outstrip its parent as to almost make her dependent upon it for a great percentage of useful and necessary merchandise.

"In our trade with all the European countires our exports largely exceed our imports. To all of Europe we shipped last year $1,040,167,312 and from the same countries received $440,509,480. That Europe takes three-fourths of all our exports shows how vitally necessary the United States is as a source of supply for the continent and how important the European markets are as an outlet for our product." It will be interesting to read over the tabulated reports of the exports from the United States in the next decade and to note the growth of the electrical industry with respect to the export trade.

THE RUBBER TRADE.

A knowledge of the rubber trade is of interest to electrical manufacturers for obvious reasons. Anticipation of the rise in prices has its benefits and the satisfaction of knowing that the condition of the trade will remain unchanged is also of value. The consumption of rubber in the United States for purposes of a varied nature is enormous. Statistics show that 130,000,000 pounds per annum are bought, approximating in value $75,000,000. More than fifty per cent. of this is from the Amazon district. It would seem as though the utilization of this vast amount of rubber will some day cause a decrease in the supply and naturally a rise in price. It seems, however, that rubber trees recuperate very rapidly when the tapping of the tree is performed with some care. In addition, the vast areas covered by rubber trees makes it seem improbable that the supply should in any way diminish to such an extent as to affect the amount of the product. Although labor is cheap in districts where rubber trees abound it is scarcer than we imagine. For this reason a heavy precentage of trees are left untapped. This gives an excellent opportunity to those that have gone through the process to return to their normal condition.

AMERICAN STEEL IN RUSSIA.

It must be rather a bitter pill for the proprietors of the Krupp works in Germany to swallow to hear that the Bethlehem Steel Company have obtained a contract

from the Russian government to supply two thousand tons of Krupp armor to be used on the Alexander III., Orbino and Oral in the shipyards at St. Petersburg. hem Steel Company and the French and German manufacturers, but reports of the best of American steel on the Retvizan, a Russian battleship in Cramp's shipyards, won the contract for the Americans.

(Continued from page 68.)

would admit of lamps being exhausted singly. With mercury pumps to secure full productive capacity, it was necessary to exhaust lamps in batches of 50 to 100 at a time, so that lamps could not receive the individual attention necessary to secure best results. This same difficulty existed for a long time with mechanical pumps, and, besides, mechanical pumps could not unaided produce the degree of exhaustion desired. The introduction of what is known as the "chemical" process of exhaustion marked an advance in lamp manufacture second only to the introduction of the cellulose filament. In this process rapidity is obtained by means of a special mechanical pump, permitting the exhaustion of lamps one by one. The refinement of the vacuum is accomplished by a special chemical process. We pump all the gases out of the bulb, so we set a thief to catch a thief. By introducing a gas capable of combining with the residual gases remaining in bulb we render these gases innocuous and secure a vacuum of perfect insulating properties. It is this process that has assisted more than any other one thing in the production of a successful 200-250-volt lamp, concerning which I have something to say later.

The improvement in methods since the early days is strikingly shown in the reduction in time of exhaustion of a lamp from five hours to one minute.

In photometric work the use of the revolving stand for the lamps in place of the fixed stand has greatly improved the accuracy and certainty of measurement. We now obtain the true mean horizontal candle-power of each lamp. Lamps are now readily measured to tenths of a candle, and the duplication of readings to within one-quarter of a volt by different operators made a regular result.

Generally speaking, methods and details of execution of the various processes have been carried to a high degree of perfection. By the subdivision of processes, limiting each distinct operation to one set of operators, by constant systematic and rigid inspection and testing following each operation, manufacturing results have been made far more exact; elimination of defects has been carried to a remarkable degree, and the precision of manufacture of simple mechanical products approximated to very closely.

IMPROVEMENTS IN QUALITY.

The art of lamp manufacture is not an exact one. The same methods will not always yield the same results. Slight or insignificant changes in processes produce most unexpected consequences and render it specially difficult to locate and remedy the cause of defects. The path from cause to effect is most undefined and undiscernible. Starting any improvement in a lamp, it requires a month or six weeks of testing by burning the lamps to ascertain the effects. All the processes must be exact, and the test along rigid lines, as otherwise the effect of the improvement may be masked or even discounted by other effects. Trial must be made not of one lamp, but of a large number, so as to secure the true average results, and avoid being misled by exceptional performances. In general, results are obtained only by a series of approximations.

In addition, the varieties of lamps required are surprisingly large, so that to the inexactness of the art is added a great complexity of product. Taking ordinary multiple lighting lamps for central station service, and omitting all specialties, we have at least ten thousand varieties of lamps in regular demand, and if we consider all the special types of lamps, miniature and battery lamps, etc., the actual varieties number over a hundred thousand.

Still further we must note that, of any lot of lamps under manufacture, not over one-third will come out at the voltage aimed for. This means, for example, that to produce 10,000 lamps for any given exact voltoge, it is necessary to make between 30,000 and 40,000 lamps, and then select from these the 10,000 lamps desired.

These several considerations may show something of the difficulties that beset the lamp manufacturer and serve to arouse our admiration of the advancement made in his art.

The most notable advance is in the matter of voltage. The early lamps were limited to 110 volts, and on alternating circuits to 50 volts. Although the 110 volt range was extended to 120 volts, lamps of these voltages were very unstable in candle-power and uncertain as to life, except at very low efficiencies, and the 50-volt lamp was the only lamp that could give fairly satisfactory results at anything better than 4 watts to the candle.

Improvements have materially changed this order of affairs. The quality of 100 to 125-volt lamps has been advanced very close to the naturally better quality of the 50-volt lamp, so that the large difference in results and performance between 50 and 100-volt types no longer exist. The 50-volt lamp was formerly twice as good as the 100-volt lamp, while at present it is but slightly more than one-quarter better. This, with the better distribuion afforded from 100-volt secondaries, and better regulation obtainable with larger transformers, is rapidly causing the displacement of 50-volt lamps. In a few years the 50-volt lamp will practically be obsolete.

The tendency is all the other way, as the limits of voltage of practical incandescent lamps have been extended to 200 and to 250 volts. These 200-250-volt lamps have been very successful. Over 400,000 of them are now annually supplied to consumers, and their use is being rapidly extended. The limitation to the use of 200-volt lamps is their low efficiency, which is 4 watts per candle or lower. At this efficiency they compare with 100-125-volt lamps of 3.1 watts per candle, giving a useful life about one-third better. In fact, they stand about halfway in results given between the 3.1-watt and 3.5-watt 100-125-volt lamps. This difference of 7-10 watt per candle, or 22 per cent. more power than the 100-volt lamp for same results, weighs against the lamp, as it means reduced light capacity of dynamos and engines and increased consumption of fuel as well. The better distributing advantages of the 200-volt system have not, therefore, been sufficient to cause a change as yet in the large direct-current central stations.

It is certainly safe to expect that, with the increased demand for these high-voltage lamps (due to the economies of distribution of the 200-volt system), concentrated skill and attention will improve their quality, and bring them nearer to the naturally better results of 100-volt lamps. This would be but repeating the history of the 50-volt versus the 100-volt lamp.

The decision of what voltage to adopt for a new installation—100 or 200—is a matter of proper engineering. As far as the incandescent lamp is concerned, the choice of the systems, as between 100 and 200 volts, follows the simple law that interest on cost of copper saved by 200-250-volt system over the 100-125-volt system must be equal to or greater than the interest and depreciation on the cost of the extra capacity of machinery and copper, plus the annual cost of extra power required by 200-volt

lamps over the corresponding 100-volt lamps. It has been shown by the writer (Electrical World, October 2, 1897) that these conditions are independent of the number of lamps and depend only on the square of the average distance from station to lamps.

Numerous inquiries are made as to the prospects of obtaining a higher efficiency lamp of this type. The 4-watt lamp is so good, it is said, why is not a 3½-watt lamp possible?

A 3½-watt 200 to 250-volt lamp is practicable. A number of such lamps have been made and sent abroad and used in special installations in this country, where they have given good results. The conditions are not ripe as yet, however, for the marketing of such a lamp. The average 200-volt station has not very close regulation, and few such stations appreciate the correct principles of lamp use. They compel their customers to buy and supply the lamps used, and as they generally sell their current by contract and not by meter, the change to the higher efficiency 3½-watt lamp would be a disadvantage to the consumer in shortening both the useful and actual life of his lamps. He would most naturally complain and condemn the lamp. To introduce a lamp under these conditions is most undesirable. Besides there are but comparatively few installations at voltages other than 220. Since all lamps cannot be made exactly to voltage, this compels the shipment of lamps of quite a range of voltage, operating directly against good life service of a higher economy lamp, as close rating in voltage is a necessity therefor. What is needed is a number of stations operating at different voltages with close regulation—supplying current on meter with free lamp renewals. A higher economy 200-volt lamp might then be introduced and tried with something like fair results.

(To be continued.)

Conventions.

MEETING OF THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES.

The next meeting of the Association of Edison Illuminating Companies will be held at Saratoga, N. Y., on September 4, 5 and 6. This meeting promises to be a great success, as the most elaborate arrangements have been made by the committee in charge both in regard to the papers which are to be read and discussed and the reception of the attendants at the convention.

CONVENTION OF THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.

The 18th annual convention of the Street Railway Association of the State of New York will be held at Buffalo on Tuesday and Wednesday, Sept. 18th and 19th, instead of Sept. 11th and 12th as previously announced. The change was made necessary in order to secure adequate hotel accomodations. Owing to a number of conventions to be held at Buffalo during the week commencing Sept. 10th, the hotels will be overcrowded upon the original dates named.

Kansas City, Mo.—The stockholders of the Kansas City, Liberty & Excelsior Railway Company, at a recent meeting elected the following officers: J. S. Clark, president; Charles H. Scott, vice-president; Chris Level, secretary; J. C. Bauserman, treasurer; Charles L. Leitch, civil engineer; Claude Hardwick, attorney. The building of the railway is to begin soon, and will be under the direction of the Leavenworth Construction Company, of Leavenworth, Kas. The company has a capitalization of $1,000,000.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED AUGUST 14, 1900.

Complete descriptions and drawing of any patent mentioned below will be sent on receipt of ten cents.

655,703. Device for Registering Electric Currents. Victor G. Fuller, Toulon, Ill.

655,716. Telegraph Relay. Isidor Kitsee, Philadelphia, Pa.

655,726. Telephone Receiver. Willam J. Murdock, Boston, Mass.

655,769. Storage Battery. Geo. A. Ford, Cleveland, Ohio.

655,772. Telephone Toll Apparatus. William A. Toss, Cleveland, Ohio.

655,779. Control of Electric Furnaces. William S. Horry, N. Y.

655,780. Electric Furnace. William S. Horry, N. Y.

655,808. Electric Arc Lamp. B. A. Stowe, Cleveland, Ohio.

655,809, 655,810 and 655,811. Signaling Apparatus and Circuit Therefor. Alfred Stromberg and Androv Carlson, Chicago, Ill.

655,838. Method of Insulating Electric Conductors. Nikola Tesla.

655,849. Telephone Bell Cutout. Luther F. Cobb, Providence, R. I.

655,883. Secondary Battery. Joseph Middleby, Jr., Malden, Mass.

655,916. Telephone. William Forst, Jr., Los Angeles, Cal.

655,968. Voltaic Cell. Eugene M. Fishell, Cleveland, Ohio.

655,992. Indicating Device for Telephone Receivers. William R. Rothvon, Florence, Ohio.

656,004. Automatic Resistance Reducing Device. Geo. H. Whittingham, Baltimore, Md.

656,012. Electric Launch. Jacob C. Chamberlain, N. Y.

656,076. Electrolytic Current Meter. Geo. L. Addenbrooke, London, Eng.

656,077. Manfacturing of Incandescent Materials for Electric Lighting. Geo. Alefeld, Darmstadt, Germany.

656,105. Circuit Breaker. Frank W. Garrett, Johnstown, Pa.

656,127. Dynamo-Electric Machine. John D. Spence, Sommerville, Mass.

656,128. Regulating Electric Machine. John D. Spence, Sommerville, Mass.

Business News.

NEW INCORPORATIONS.

Riverside, N. J.—The American Electrical Amusement Company, of Riverside, has been incorporated with a capital of $1,000,000. It proposes running tramways in public parks and seaside resorts. The incorporators are: George Richards and Paul Morris, of Philadelphia, and Edward Schwabenland, of Riverside.

Binghamton, N. Y.—The Susquehanna Valley Electric Company, to operate in Delaware County, has been incorporated at Albany with a capital of $200,000. Directors are: Henry B. Oakman and Edwin T. Tucker, of Brooklyn; Charles F. Lehman, of Smithtown; C. C. Higgins, of Bedford; L. U. Shopter, of Rockwell Center.

TELEPHONE CALLS.

Mount Vernon, N. Y.—The New York Telephone Company is preparing to erect a modern four-story fireproof exhange building in Mount Vernon, N. Y. The cost of the building will be about $40,000.

Franklinville, N. Y.—The Franklinville Telephone Company, of Franklinville, has been incorporated to operate a telephone line. Capital, $10,000; incorporators: C. L. Randall, R. S. Litchfield, G. W. G. Ferris, all of Franklinville.

Cortland, N. Y.—At the last meeting of the Home Telephone Company, of Cortland, N. Y., the contract for constructing the line was given to the Central Construction Company, of Wisconsin. The work of setting the poles, stringing the wires and locating the instruments must be completed by September 10.

Thompson, Pa.—The Northeastern Pennsylvania Telephone Company, of the Borough of Thompson, Susquehanna County, has been chartered with a capital of $10,000, to construct telephone lines in the counties of Susquehanna, Wayne and Lackawanna. The directors are: A. H. Crozier, S. S. Hubbard, of Thompson; W. W. Mumford, of Starrucca; H. W. Kessler, of Brandt; F. J. Osgood, of Forest City.

Buffalo, N. Y.—It is said that the sub-companies of the Erie Telephone system increased their net earnings over 41 per cent. for the six months ending June 30 over the corresponding six months of last year. The gross income for the year 1900 will exceed $5,000,000, as compared with $3,600,000 for the year 1899. The Erie's proportion of the net earnings is at the rate of 9 per cent. on the capital employed, and will average for the year the same as last year, namely, 10 per cent., after deducting all interest and fixed charges.

Macon, Ga.—At a meeting of the mayor and council of Macon, Ga., recently, an ordinance was passed granting to A. Bisbee & Company the right to construct a telephone system in Macon in accordance with a contract to be drawn up by the city attorney. One of the conditions of the contract will be that the company must give a bond of $25,000 that it will not sell to any other competing telephone company. The new company proposes to give a much cheaper service than the Southern Bell Telephone Company is now giving.

San Francisco, Cal.—All the telephone companies in California, Oregon, Washington, Nevada, Idaho and Arizona have been consolidated, the new corporation being the Pacific States Telephone and Telegraph Company. It is capitalized at $15,000,000. Of this, $10,000,000 has been issued to stockholders in the old corporations, and $5,000,000 has been held in trust to provide for future extension and improvements. The companies entering the combine are the Sunset Telephone and Telegraph Company, Pacific Telephone and Telegraph Company, the Oregon Telephone and Telegraph Company and Inland Telephone and Telegraph Company. This does not mean that any opposition companies are bought out, for all four of the combination companies are licensees of the American Bell Telephone Company, and have hitherto been affiliated.

STREET RAILWAY NEWS.

Baltimore, Md.—The electric road between Havre de Grace and Belair, Md., is now said to be an assured fact.

Cincinnati, O.—A movement is on foot for an electric line to connect Painesville, Ohio, with Ashtabula. Much of the right of way has been secured.

Miamisburg, Ohio.—The Miamisburg, Ohio & Germantown Traction Company has been incorporated with a capital stock of $50,000. The incorporators are: W. A. Mays, A. F. Gwinner, S. H. Mays, C. W. Dodds and Albert Dwyer.

Girardville, Pa.—A meeting of the stockholders and board of directors of the Schuykill Traction Company has decided to increase the preferred stock of the company from $250,000 to $500,000, and to increase the common stock of the company from $750,000 to $1,500,000.

Detroit, Mich.—Efforts towards the construction of an electric road from Port Huron, Mich., to Lexington, and ultimately further into the Thumb and to Bay City are still progressing and the right of way from the city limits to Lexington is secured. English money is said to be backing the enterprise.

Grand Rapids, Mich.—A company has been organized to build an electric railroad from Grand Rapids to Muskegon. James D. Hawks, head of the Detroit, Ypsilanti & Ann Arbor Road, is president, and Wallace Franklin, representative of the Westinghouse Electrical Supply Company, treasurer. All funds are secured for the line, which will cost $1,500,000, and is to be one of the model electric roads of the country. The track will parallel the highways.

Nazareth, Pa.—A charter has been issued at Harrisburg to the Cement Belt Street Railway Company, with a capital of $72,000, to erect 12 miles of street railway, conneting the Borough of Nazareth, Christian Springs, Bath and Siefried, in Northampton County, Pa. The directors are: Thomas A. H. Hay, Howard Mutchler, William O. Hay, Charles L. Hemingway, of Easton; Frank J. Myers, of Petersville; John Blair and Moses George, of Bath.

Pottsville, Pa.—A charter has been granted by the State Department, at Harrisburg, to the Shenandoah & Pottsville Electric Railway Company, with a capital stock of $125,000. Powell Evans, of Philadelphia, one of the financial men, and a member of the board of directors of the Schuylkill Traction Company, is the president of the new company. The line of the proposed railway will begin at Maizeville, where it will connect with the line of the Schuylkill Traction Company, and will cross the mountain reaching Frackville, and will run to Lower St. Clair, where it will follow the line of the Pennsylvania Railroad, and enter Pottsville at the upper end of

NEW YORK NOTES.

The Sprague Electric Company reports an unusually large and steadily increasing business along all the lines of its manufactures. The Lundell fans have had a big sale and the sales in the interior conduit department have exceeded all previous seasons. The company has just issued a revised edition of the bulletin describing the Greenfield flexible steel armored conductors. It contains additional illustrations and prices. Among other orders received for motors and generators is one from the Cooke Locomotive & Machine Co., of Paterson, N. J., for a standard 300 kilowatt split pole generator of the belted type.



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The Electrical Age.

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The Incandescent Lamp.

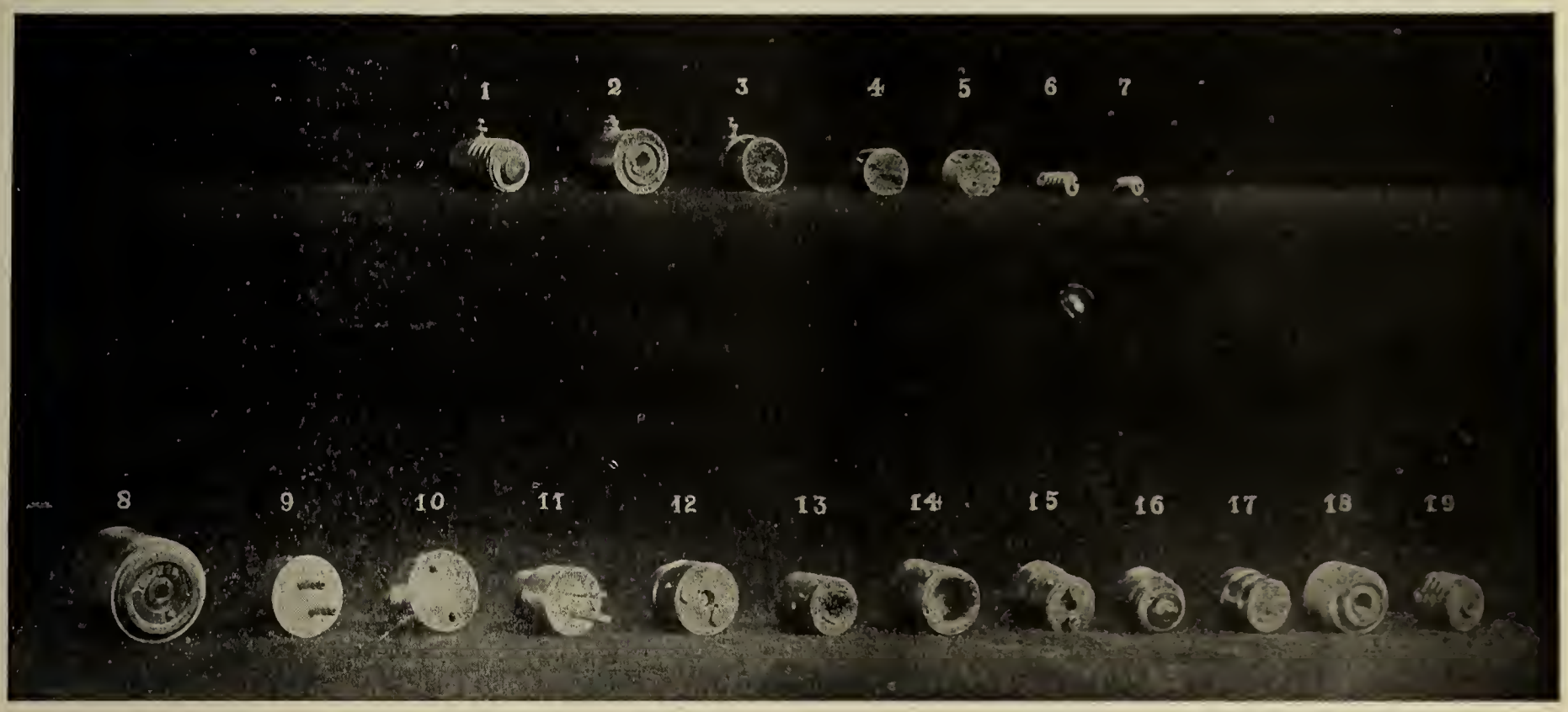


Plate I.—Types of the Different Styles of Lamp Bases.

1—Base Edison night lamp.
2—Base Thomson-Houston night lamp.
3—Base Westinghouse night lamp.
4—Edison Swan base (brass).
5—Edison Swan base (porcelain).
6—Base Candelabra lamp.
7—Base miniature lamp.
8—Base series lamp (bottom cut out).
9—Bernstein base.
10—Schaeffer base.
11—Fort Wayne Jenny base.
12—Loomis base.
13—Hawkeye base.
14—Mather or Perkins base.
15—Brush Swan base.
16—United States base.
17—Westinghouse base.
18—Thomson-Houston base (porcelain).
19—Edison base.

INCANDESCENT LAMPS.*

BY FRANCIS W. WILLCOX.

(Continued from page 71.)

These conditions will gradually grow and the 3½-watt lamp with them. In the meantime we may look for the introduction of lamps between 4 and 3½ watts economy. One large station has already arranged for a supply of 3.8-watt lamps on its 200-volt circuit, and it is possible that this economy will supplant the 4-watt type.

In the economy or efficency of 100-125-volt lamps the advance has been made from 5 and 6 watts to 3 watts per candle. Surprise is frequently expressed that a higher economy than 3 watts has not been made and put in service. This surprise is natural, but shows a lack of understanding of the meaning of efficiency. It is true that the so-called 3.1-watt lamp has been on the market for some years, but what was the early 3.1-watt lamp? It was a lamp so made as to consume 3.1 watts per candle of light at the start. In a few hours it became a 3½-watt lamp and ended a short and inglorious life at below 5 watts to the candle. Now a 2½ watt lamp can be obtained to-day that will give as good results as these early 3.1-watt lamps. Fortunately, however, customers have grown to appreciate good maintenance of candle-power, and have learned that it is the average efficiency of a lamp and not its initial efficiency which is the proper measure. By the test of average efficiency for the

*Read before the Franklin Institute.

shortest period of life acceptable to-day—400 hours—there is as yet nc full 3-watt lamp, the average being for the best lamps to-day about 3¼ watts per candle.

It is by the comparison of average efficiencies that we can best note the improvement in lamp quality. The greatest advance has been along this line, i. e., the increase in average efficiency. The early 3.1-watt lamps had an average efficiency of about 3.8 watts per candle, and even below 4 watts, if we reckon results for the long period lamps were then continued in service. To change from 3.8 to 3¼ watts per candle marks, therefore, a most decided progress. This has been accomplished not only by improvements in manufacture, but also by the education of lighting companies to accept a shorter period of service from their lamps, and renew them frequently instead of permitting them to burn until broken.

Close and uniform rating is one of the chief essentials for a lamp, and a distinct advance has been effected in this respect. Early conditions with extreme voltage variation and the absence of meters rendered it perhaps redundant to have close candle-power and watt limits. This is a noteworthy instance where refinement of service conditions has made refinement of product a necessity. Again the early installations were all too largely established at some so-called standard voltage, 52, 104 and 110. The well-known inexactness of lamp manufacture as to voltage was far worse then than now, so that to ship his entire product the manufacturer naturally gave out quite an assortment of voltages. Since that time the importance of distributing installations at various voltages has been preached and practised, and the overcrowding of voltages like 104 and 110 somewhat relieved.

The adoption of a common standard of candle-power among manufacturers has likewise assisted. The time when each manufacturer had a candle-power standard of his own has passed. The leading American companies are to-day rating their lamps by the English parliamentary standard, taking the mean horizontal candle-power of each lamp when rotated at about 180 revolutions per minute.

The leading makers now photometer each and every lamp, and the practice of photometering a few and picking out the remainder by the eye is past, or continued only by the small and incompetent factories. The result is that lamps are to-day regularly supplied by the reliable manufacturer tested to the quarter of a volt, no lamp varying more than one candle above or below its rating, nor more than 6 per cent. above or below its rated wattage when tested at marked voltage.

This close and uniform rating has a most marked effect in improvement of the service the lamps give. With close candle-power and total wattage rating, their ratio, the watts per candle, is fixed exact. This means that all the filaments burn at exactly the same temperature and strain. It is quite evident that evenness of this temperature or strain will materially increase evenness of results in the life and maintained candle-power performance.

Let me refer again to the subject of so-called standard voltages. Although, as stated, there has been some relief from overcrowding these voltages, conditions are as yet far from perfect. Generally speaking, customers who remain at such voltages as 104 or 110 or 220 will invariably get the poorest lamps of whatever make they may purchase. This is a fact that cannot be too generally known. There are more than three times as many 110-volt lamps used to-day than are made. This means that the average customer who orders 110-volt lamps gets lamps marked 110, but really of some other voltage (either 107, 108, 109, 111, 112 or 113). There is no virtue in 104, 110 or 200, and the wise central station manager is he who changes his voltage to some special point, as, for example, 107 and 108, or 113 and 114, 117 and 118, 122 and 123, 208, 212, 230, 240, etc. Such changes can be and have been made with comparative ease even on the largest installations.

The standard lamp of this country is the 16 candle-power lamp—in Europe the 8. In the last two or three years the demand for lamps of lower candle-power, 10, 8, 6 and even 4, has grown very large. This has been due to enforced competition for residence lighting, to the adoption of meters and to sign and decorative lighting. As a general principle in lighting, a number of small units can be distributed to give a better illuminating effect than an equivalent candle-power in larger, and, therefore, fewer units. Thus, sixteen 8 candle-power lamps distributed will give better results than eight 16 candle-power lamps. For many locations a 16 candle-power lamp is too large a unit. Electric light must compete with gas, which is quite largely used turned down. These are some among many reasons why the lower candle-power lamps, such as the 8 candle-power, should be more largely used and perhaps become the standard in place of the 16. The difficulty is that an 8 candle power lamp cannot be made which at the same efficiency will give results equal in either life or maintained candle-power performance to the 16 candle-power. This is due to the naturally thinner and more delicate 8 candle-power filament. This results in the use of 8 candle-power lamps of lower economies than that of the 16 candle-power in use, unless shorter life and reduced candle-power performance are to be accepted. The alternative of shorter life could be adopted to advantage by many central stations who to-day retain their 16 candle-power lamps too long in service.

The quality of the 8 candle-power lamps, formerly very poor, has, however, in the last two years been materially advanced, so that it is not much below 100 hours short of the 16 candle-power in useful life. This is under perfect voltage conditions. As in service such conditions are but seldom realized, 8 candle-power lamps will not appear to quite such advantage.

In physical respects the modern lamp appears to most marked advantage in comparison with the early types. The bulbs then blown free-hand, of varying sizes and shapes, are now replaced by the moulded bulb of exact size to the die. The long concave neck has given place to the short-neck straight-sided bulb of less obtrusive and more practical character.

The filaments have been symmetrically shaped, giving an artistic effect and increasing the spherical candle-power (with the same mean horizontal). The filaments are anchored or so supported that there is no drooping. The inside parts are all accurately gauged and placed, so that each lamp is the exact counterpart of any other in respect to all its details.

In early days every manufacturer of a new system had to have a special socket and lamp base. There were no less than thirteen different types of bases in this country alone, and in Europe about as many more varieties. This naturally multiplied the types of lamps very greatly, and was a great burden to both manufacturer and customer. Simplification has progressed so far already in this matter that there are to-day in this country practically only three bases, the Edison, Thomson-Houston and Westinghouse. The tendency is strongly towards a still further reduction to one, i. e., the Edison. This is a pure case of survival of the fittest. The Westinghouse base and socket have, as is well known, the grave fault of poor and uncertain contacts, which are aggravated by use. The Thomson-Houston, while perhaps a good socket, is one of the most troublesome of bases. The screwing of a Thomson-Houston base in its socket acts to tear it apart (the reverse of the Edison, where the re-

sult is a binding action holding the parts together); the contacts are very close together, and are liable to arcing and short-circuiting. The Thomson-Houston base is also complex and expensive. It has three or four parts to two for the Edison, and costs about 1 cent a piece more. On this account there is an extra charge of 1 cent per lamp on all Thomson-Houston base lamps, and this is operating effectually and gradually to render the Thomson-Houston base obsolete. This change is helped by an adapter, furnished by the General Electric Company, which, by simply screwing in the socket, changes it from a Thomson-Houston to the Edison type.

This change to one standard base will require some time, however, as there are still a large number of both Westinghouse and Thomson-Houston in use, and the change of the Westinghouse requiring a complete replacement of sockets is costly and troublesome. Roughly estimated, the proportion of the different sockets in use in the United States is as follows:

	Per cent.
Edison	55
Thomson-Houston	25
Westinghouse	15
All other types	5

The only real objection to the Edison base was the live contact exposed by the portion of the shell part of base extending outside of socket. This has been corrected by shortening the shell, so that socket entirely covers base. The use of porcelain marks the greatest improvement in bases—the Thomson-Houston base is now made entirely of procelain with metal contacts.

The improvement in average efficiency to which I have referred concerns the candle-power performances. Such a notable advance has been made in this respect, however, that it will be of interest to speak of it again in another way.

In diagram, Fig. 1, we have two curves—the lower one shows the candle-power performance by hours of burning for the early 3.1-watt lamps, and the upper one the present lamp of same make, the comparison basis, at 200 hours, and the present lamp at 450 hours.

Such lamps as give a result like these early ones no station could afford to-day to use, at less than half the price of the present best ones.

A word or two about the improved methods of supply. Lamps are now purchased by all large users on what is known as the future delivery system. On this plan the customer places his order for his year needs, specified as to types desired, with the manufacturer, and lamps are shipped to him thereon during the year as he needs them. This system has proved of inestimable value to both manufacturer and customer. It permits the manufacturer to run his factory uniformly through the year, avoiding the old conditions of heavy rush production in the fall and winter and the reduced output of summer. It allows the accumulation of the requisite stocks for prompt shipments during the rush season. It guides the manufacturer as to the classes and types of lamps desired and the number of each, and thus enables him to avoid producing dead stock. In early days the dead stock accumulated through lack of knowledge of requirements was tremendous. Many thousands of lamps that could not be sold had to be annually broken up.

The economies of this future delivery system secure

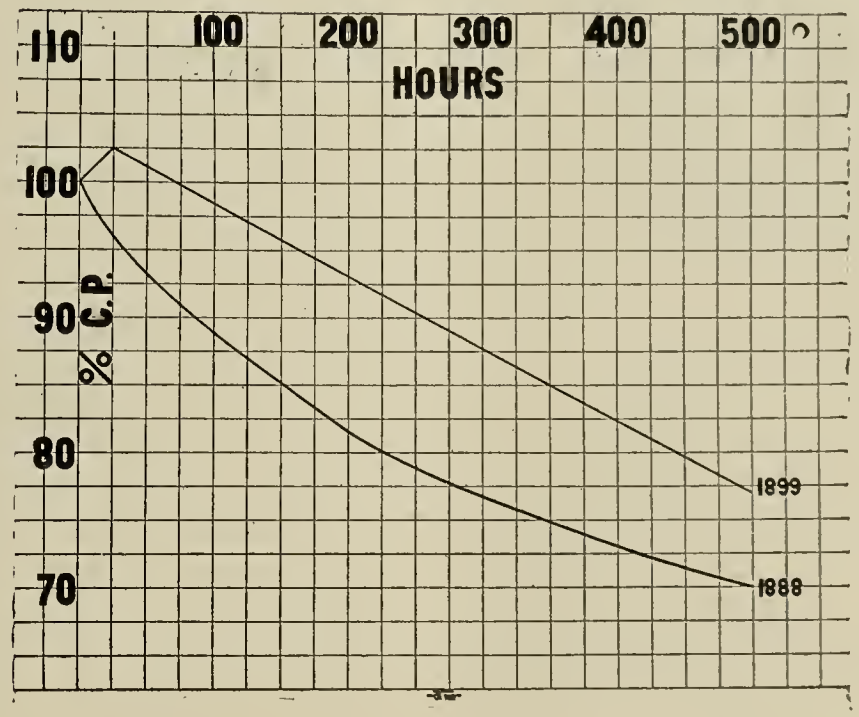


Fig. 1.—Curves Showing Ten Years' Improvement in Candle-Power Performance of 3·1-Watt Incandescent Lamps.

the customer a special price. It is not too much to say that the future delivery system is the mainstay of the lamp business to-day. It would be impossible to supply the high-grade closely-rated product sold to-day at the present low prices without future delivery orders from the consumers.

(To be continued.)

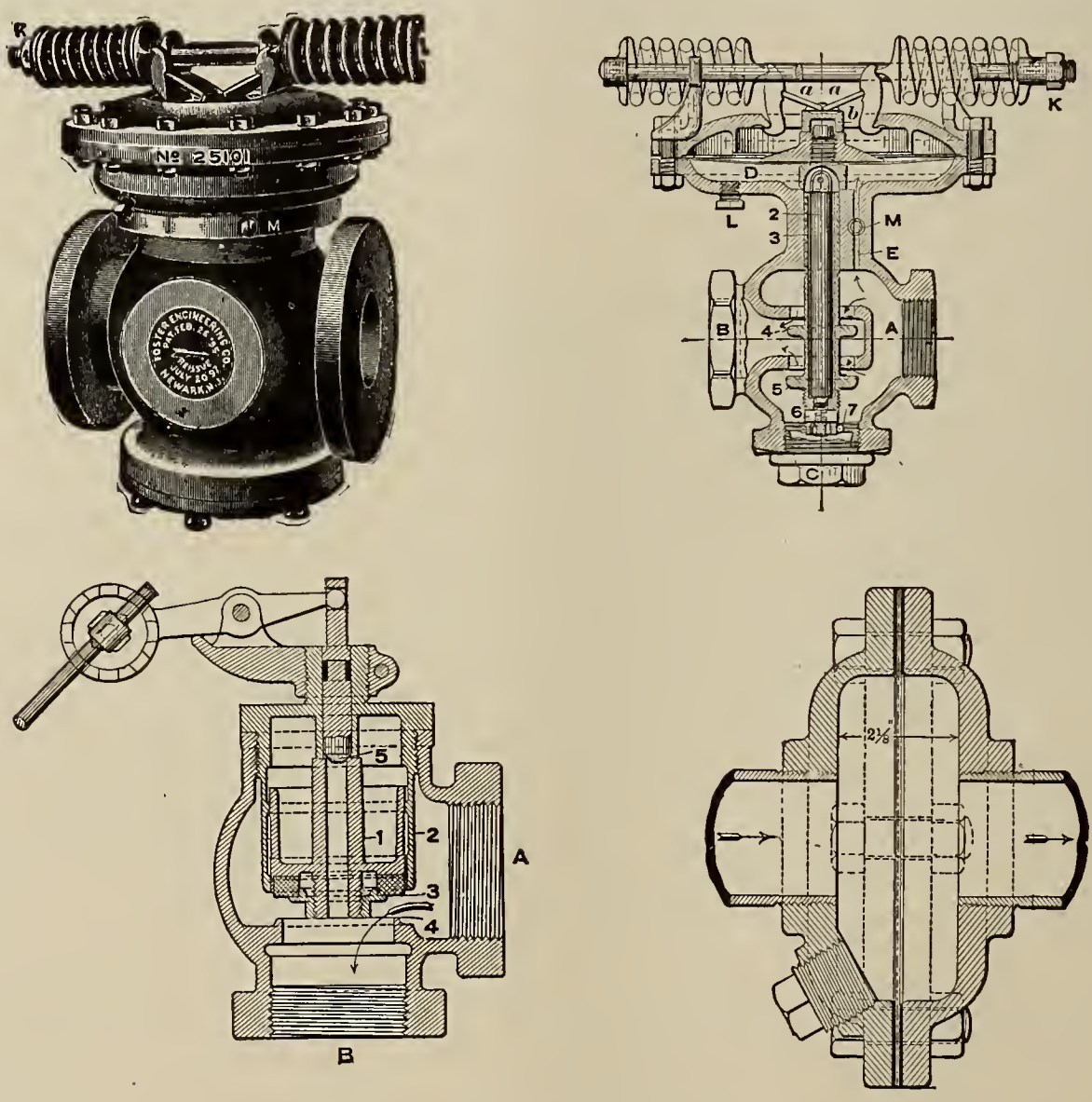
LITERARY NOTE.

There are some striking pen-pictures of Chinese life in "The Attache at Peking," by A. B. Freeman Mitford, who was at one time secretary to the British embassy to China. Mr. Freeman Mitford's book consists of a series of letters describing Taku, Tientsin, Tung-Chow, Shanghai, Peking, and Canton, and it is full of shrewd observation and study of Chinese manners and customs. The author had a keen eye too for odd and amusing incidents, many of which make very lively and entertaining reading. The Macmillan Company will publish the book early in September.

Power House Specialties.

THE FOSTER PRESSURE REGULATOR.

In the illustrations are shown types of pressure regulators, reducing valves, pump governors and other high grade steam specialties for steam, water, gas or air. The Foster pressure regulator possesses as its leading features a compensating spring movement, exerting an unvarying power on the diaphragm, full steam way through the valve, great simplicity of construction and operation, no friction of parts, no small ports to clog, no dashpot, the feature of noiselessness and it is absolutely automatic after adjustment of pressure. These regulators are built in different sizes but are adjustable to an initial pressure for the delivery of one considerably lower. They are made of all sizes, from one-half to eighteen inches, and may be found in use on the finest steamers, armored cruisers, battleships and some of the best stationary plants in the world. As shown in the cross sectional view, the steam or gas playing upon the diaphragm affects the springs, which may be regulated to allow a final pressure to escape as low or high as required. For steam heating not exceeding fifteen pounds the Foster regulator is of the utmost value. For induced or forced draughts, regulating the speed of the fan by the pressure in the boilers, where fan engine regulators are employed, great advantages are secured. In the illustrations are also shown strainers to prevent scale, grit, cuttings, etc., from lodging on the valve seats. They remedy many defects in valves. The Foster non-return stop valve is also shown. It is an absolute safeguard against disaster in a battery where two or more boilers are connected to a single header or steam pipe. If an accident, such as bursting of a tube, occurs between boilers carrying different pressures the valves will close at once and escape of steam from other parts of the battery is prevented. By its use steam from a battery cannot gain admission to a cold boiler. The Foster back-pressure valve, also illustrated, obviates the difficulties found in the ordinary back-pressure valve, where direct acting springs are used or those of other types. The control in this case is perfect. The Foster float valve, for the purpose of maintaining a constant level in tanks, is quick and sensitive, will not leak and may be located at any desired point on the supply pipe of an open tank service. A small float connecting to it by wire will govern its operation. The Foster relief or free exhaust valve is used for such cases where in condensing engines instant relief to the exhaust takes place in case of failure of the condenser and a loss of vacuum. The Foster piston actuated pump governor with compensating spring was designed to meet the demand for a governor controlled solely by the discharge pressure. The valve clappers have Jenkins composition disks which can be renewed and applied by any engineer and insure perfectly tight seats. The compensating spring movement allows the steam valve to open or close instantly to the fullest extent necessary with slight variation of discharge pressure. The water pressure regulator, also illustrated, is adapted for use in private residences, hotels, etc., where there is little variation in the initial pressure as supplied by gravity from tanks or elevated reservoirs. The Foster fluid actuated speed governor with balanced valve regulates the speed of pump or engine to any number of strokes and maintains it regardless of suction, change of load or steam pressure. The above line of specialties is manufactured and sold by the Foster Engineering Company, of Newark, N. J.



FOSTER STEAM SPECIALTIES.

Foster Pressure Regulator.
Float Valve. Strainer.

The Electrical Age.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.

JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

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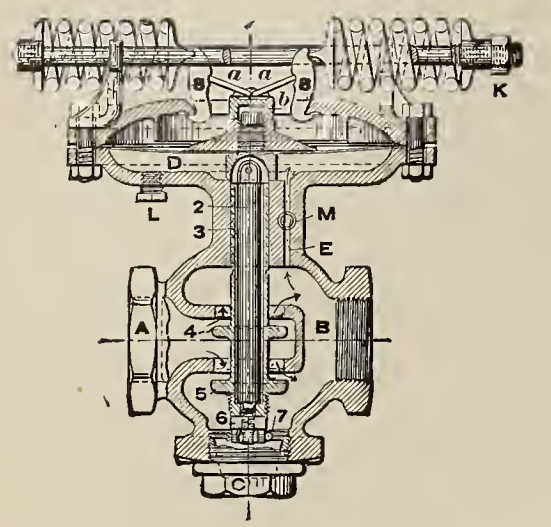
KEROSENE OIL FOR ELECTRIC LIGHTING.

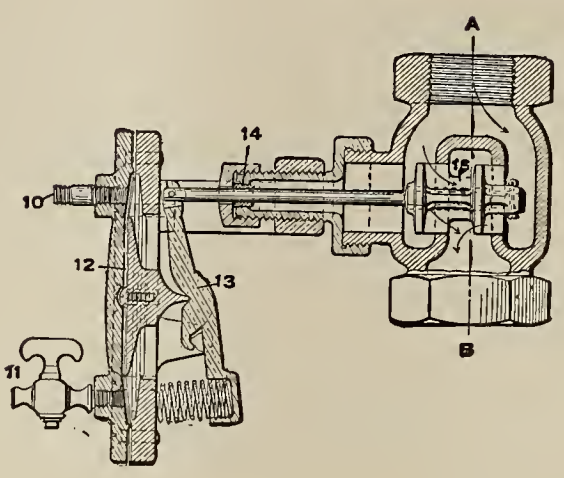
The ambition of many proprietors of small stores using more than fifty lights is the ownership of their own electric light plant. The cost of gas and the risks from fire, in spite of the advantage of the Welsbach burner, and the expense each month of current supplied by electric light companies has turned the attention of many tradesmen to not only a cheaper source of illumination, such as is offered by a small electric light plant, but one that they can easily care for. A combination of this kind, embodying simple construction and cheapness of operation, will appeal to many thousands of store keepers all over the United States and particularly in large cities. The use of kerosene has suggested itself to manufacturers for obvious reasons as a fuel to be used for electric lighting. It is estimated that a good kerosene engine takes no more than one pint of kerosene per horse power hour. As the price of kerosene is largely governed by the market demand, which is pretty uniform, the cost of kerosene in any given case is well within the limits imposed by economical considerations. By the use of kerosene oil plants can be operated at the small cost of one-half cent per horse power hour.

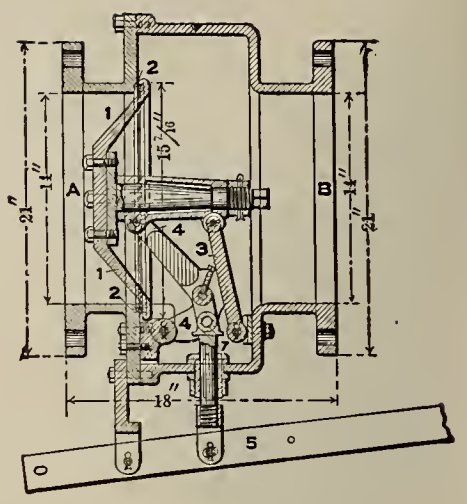
To take a specific case of say a fifty-light plant it is easy to realize that neither the electric light nor gas companies can compete with a kerosene engine, producing electricity at one cent per horse power hour. A fifty-light plant would therefore cost about five cents an hour to operate and on the basis of a five hours' run year in and year out 25 cents a night would bring the total bill for electric lighting each month to less than ten dollars. Other things must be considered, of course, such as the cost of the plant, rate of depreciation and incidental expenses, but the saving is quite evident, the risk small and the investment moderate. During the Christmas period the advantage of having electric power is seen by the various forms of decorative effects employed by all storekeepers. The additional advantage of displaying goods in the windows in the most attractive manner adds to the prestige of the proprietor and in various other ways the man of moderate means find the ownership of a small plant a great source of satisfaction.

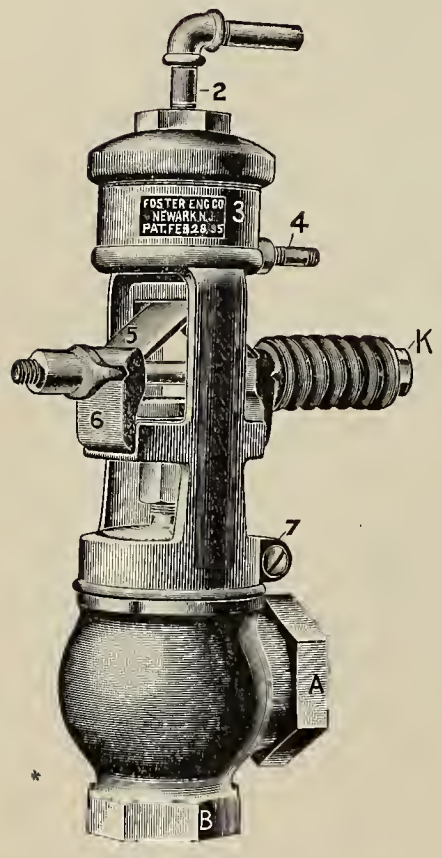
The growing trade in small electric light plants, in which the motive power is gas as well as kerosene or gasolene, is due to the heavy expense entailed by the use of current from electric light companies. It is much dearer than gas and in many respects more expensive to lay wires than to lay gas pipes. The advantage of electric lighting and power for small purposes is counterbalanced by the magnitude of the bill. Why there is such a difference in charge at various places in the same locality is almost incomprehensible. The larger the company it seems the easier it is to lower the rates for electric lighting. Yet we find it just the reverse. The larger the electric light company the more apt it is to over-charge for light and power, and in cases where great quantities of power are required the business managers are forced to adopt some other means for securing what they need. A variety of little towns along the Hudson and in the near neighborhood of New York charge more than fifty per cent. less for electricity than our large cosmopolitan plants. If the investment has been heavy the simplest manner of paying the interest on it seems to be by the adoption of a broader policy, lower rates and more customers. At present the pople using electricity for light and power and cooking belong to the select few, living in expensive homes and caring little for the additional cost per annum. To the great majority, however, a few dollars difference is of vital importance and makes them prefer the inconvenience of gas to the great benefits of electricity.

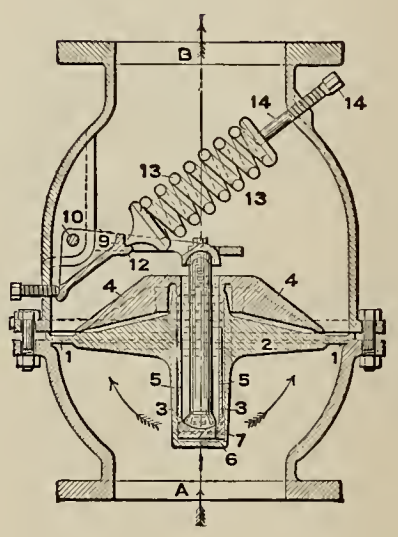
With the period of experimentation practically over and institutions now established for electric lighting, power supply, telephoning, etc., it would seems as though the general public ought to enter more largely into the consideration of the officers of these corporations. The interests of such individuals are at present a small percentage of what they will be in the future and the profits due to a sudden increase in patronage are little or nothing in comparison with what they will be. In Greater New York there are more than three and one-half millions of people. At least five hundred thousand families are in a position to pay a moderate amount each year for telephone service and electric light. As yet they have not been reached and it would seem strange that the future policy of those controlling these interests were not directed in such a manner as to quickly embrace this opportunity. In the smaller towns of the United States the cost for telephone service is less than half of what it is here. It is not to be supposed for an instant, however, that power is being abused in any way, but so few out of the many are able to make use of these modern necessities that the cause can only be traced to their expense. On the Continent the telephone is as indispensable as gas is now considered to be. That feeling has not reached this country though it would be much wiser to develop it than have it die from lack of attention. The new century should be made noteworthy by the common use of the telephone and electric light in the majority of homes and business establishments. Progress within the home should keep pace with that outside.

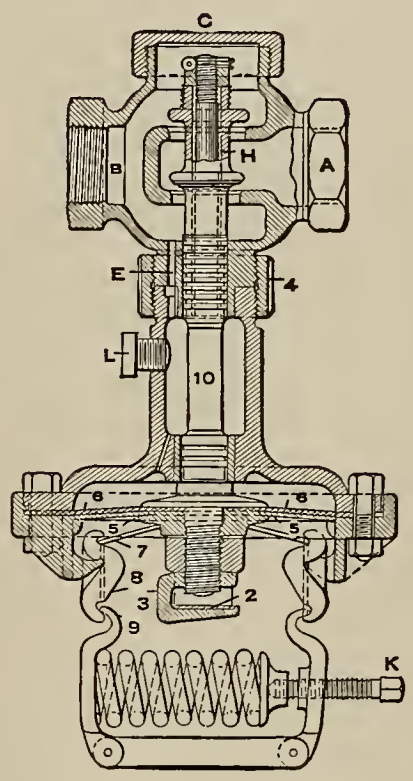


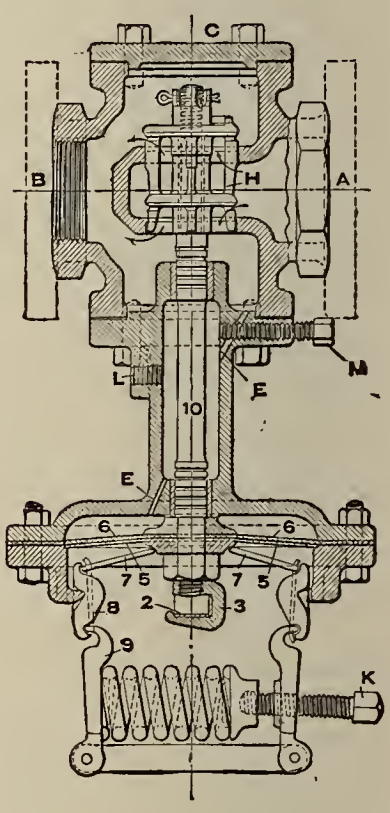


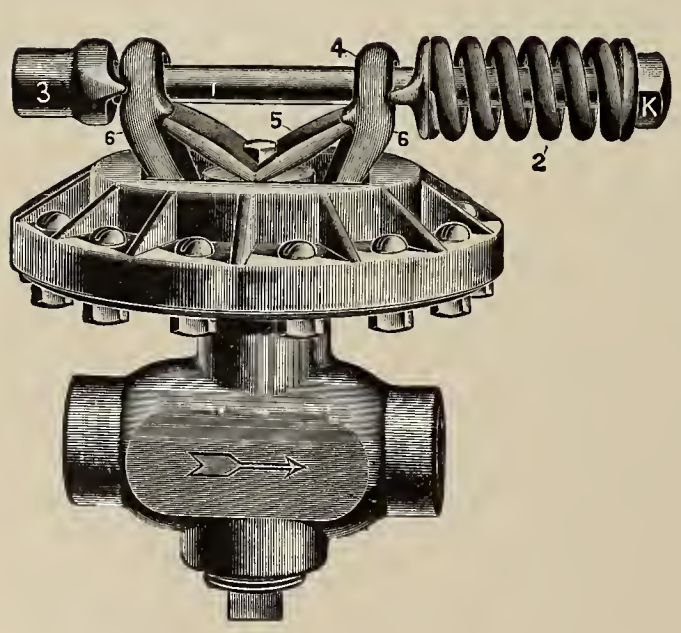


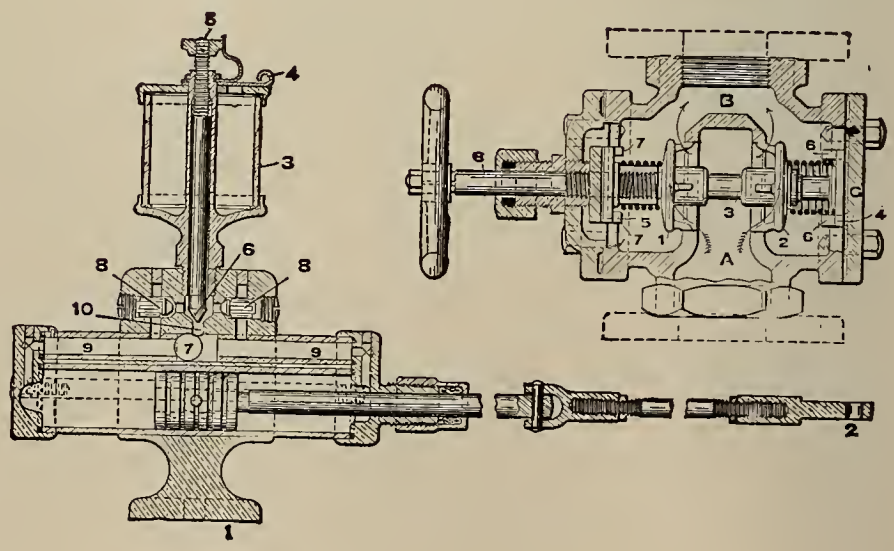












FOSTER STEAM SPECIALTIES.

Fan Engine Regulator.
Piston-Actuated Pump Governor.
Water Pressure Regulator.

Fluid-Actuated Speed Governor.
Back Pressure Valve.
Fluid-Actuated Speed Governor.

Relief or Free Exhaust Valve.
Low Pressure Regulators.
Non-Return Stop Valve.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.

PATENTS ISSUED AUGUST 21, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

656,158. Confiner of Wires for Electrical Connections. C. F. Ash, New York, N. Y.

656,165. Electric Generating Apparatus. J. H. Bickford, Salem, Mass.

656,177. Commutator. J. T. H. Dempster, Schenectady, N. Y.

656,192. Manufacture of Pipes or Conduits for Electrical Conductors. A. H. Howard, London, England.

656,211. Electric Lamp Supporting Bracket for Desks. S. S. Porter, Melrose, Mass.

656,266. System of Electrical Distribution. H. F. Roach, St. Louis, Mo.

656,276. Electric Railway System. L. E. Walkins, Springfield, Mass.

656,282. Circuit Breaker. G. S. W. Brubaker, Philadelphia, Pa.

656,284. System of Non-Interchangeable Contact Parts. M. Forschi, Vienna, Austria.

656,291. Switch. E. W. G. C. Hoffmann, Charlottenburg, Germany.

656,292. Electrically Operated Submarine Torpedo. P. C. F. Hoffmann, Kiel, Germany.

656,305. Process of Electrolytically Extracting Zinc from Ores. W. Strzoda, Falenze, Germany.

656,309. Electric Burglar Alarm. P. V. Vandevelde, New York, N. Y.

656,323. Electric Bicycle. A. Hansel, Zeitz, Germany.

656,324. Controlled Electrical Currents. A. B. Holmes, Liverpool, England.

656,333. Telephone Switchboard Apparatus. T. C. Wales, Jr., Newton, Mass.

656,336. Switchboard for Telephones. M. I. Baird, Glenfield, Pa.

656,384. Switchboard for Telephones. M. I. Baird, Glenfield, Pa.

656,421. Brush-holder Ring. H. G. Reist, Schenectady, N. Y.

656,431. Cord Adjuster for Electric Lights. F. H. Stewart, Camden, N. J.

656,434. Combined Visible and Audible Signal. E. W. Vogel, Chicago, Ill.

656,541. Automatic Circuit Interrupter. L. Fleischmann, Schenectady, N. Y.

656,454. System of Non-Interchangeable Electrical Contact Parts. M. Froschl, Vienna, Austria.

656,455. Summation Meter. J. Harris, Lynn, Mass.

656,473. Electric Controller. C. J. Reed, Philadelphia, Pa.

656,511. Electric Railway System. L. L. Campbell, New York, N. Y.

656,522. Apparatus for Converting Alternating Currents into Continuous Currents. Max Deri, Vienna, Austria.

656,558. Electrolytic Apparatus. G. Loiselet, Paris, France.

656,571. Controller for Electric Motors. T. S. Perkins, Idlewood, Pa.

656,578. System of Electrical Distribution. W. J. Davis, Jr., Schnectady, N. Y.

Business News.

NEW INCORPORATIONS.

Dover, Del.—The Union Light and Heat Company, of Cincinnati, has been incorporated with a capital of $200,000.

Sandusky, Ohio.—The Citizens' Electric Light and Power Company, of Sandusky, capital $100,000, has been incorporated by John Sherfin, J. B. Hanna, H. A. Everett, B. Mahler, W. H. Price, Geo. A. Stanley, James Hoge, C. H. Stewart and Chas. W. Wasson.

Fort Wayne, Ind.—The Belden-Larwill Electrical and Manufacturing Company, of Fort Wayne, has been incorporated to manufacture electrical supplies. Capital, $100,000; incorporators: E. H. Belden, C. H. Larwill, S. M. Foster, C. A. Wilding, G. P. Evans, M. C. McDougal, A. Weil, all of Fort Wayne.

York Furnace, Pa.—The York Furnace Electric Company, which was granted a charter at Harrisburg, is composed of Lancaster capitalists. Their purpose is to develop the water-power in the Susquehanna, near York Furnace, and build an immense electric power house. The incorporators are John W. Holman, George B. Wilson, Newton J. Miller, William F. Beyer and Frederick Shoff.

TELEPHONE CALLS.

Ridgeville, Ind.—The Ridgeville Telephone Company, of Ridgeville, has been chartered to operate a telephone exchange. Capital, $8,000; incorporators: S. C. Long, R. O. Fraser, D. G. Heister, M. T. Sumptein, all of Ridgeville.

Desplains, Ill.—The F. E. Bell Telephone Company, of Desplains, has been incorporated. Capital stock, $10,000; incorporators: Frank E. Bell, Edward A. Manuel and William Nunn.

Springville, N. Y.—The Springville Telephone Company, of Springville, Erie Country, has been incorporated. Capital, $5,000; directors: M. N. Brooksell, F. D. Smith and A. A. Churchill, of Springville.

Monticello, Ind.—The Monticello Telephone Company, of Monticello, Ind., has been incorporated; capital stock, $25,000; directors: Madison T. Didlake, Marcellus Waltz, John W. Jost, John G. Clark and Thaddeus E. Hanway.

Henrietta, Tex.—The Farmers' and Merchants' Telephone Company, of Henrietta, has been incorporated. Capital, $1,200; incorporators: J. D. Stine, A. C. Thompson, W. B. Worsham, all of Henrietta.

Advance, Ind.—The Advance Telephone Company, of Advance, has been chartered; capital stock, $2,000; directors: Thomas M. Shera, J. M. Sandy, M. P. Riner, J. V. Riner, P. J. Riner, Sullivan Leap, C. L. Airhart and B. F. Jones.

Dresden Station, N. Y.—The Co-operant Telephone Company, of Dresden Station, Washington County, has been incorporated. Capital, $15,000; directors: R. N. Clemens, Dresden Station; J. A. McLaughlin, Putnam; E. J. Gray, Whithall.

Greeley, Colo.—The Greeley Independent Telephone Company, of Greeley, has been organized to construct telephone wires. Capital, $10,000; incorporators: A. W. Trenholm, B. F. Johnson, J. E. Neill, G. F. Shear, all of Greeley.

New Augusta, Ind.—The Independent Telephone Company, of New Augusta, has been chartered to operate telephone exchange. Capital, $10,000; incorporators: M. J. Nagle, W. Johnson, W. B. McDonald, J. Harcourt, G. T. Avery, all of New Augusta.

Willmar, Minn.—The Kandeyohi County Telephone Company, Willmar, has been chartered to conduct a

telephone exchange. Capital, $10,000; incorporators: P. J. Haley, A. F. Hansom, J. M. Spicer, all of Willmar; J. O. Lundberg, of Svea; H. B. Eddy, of Whitefield.

Lima, Ohio.—The Lima Telephone Company, of Lima, Ohio, has been incorporated for a general telephone and telegraph business. Capital, $100,000; incorporators: H. W. Neff, K. W. Huges, M. C. Purtscher, W. M. Miller, C. F. Stolzenback, all of Lima, Ohio; Cable & Parmenter, attorneys, Lima, Ohio.

Point Pleasant, W. Va.—The Mason County Telephone Company, of Point Pleasant, has been incorporated to operate telephone lines. Capital, $25,000; incorporators: F. B. Tippett, E. J. Messman, both of Point Pleasant; F. A. Stemple, F. J. Spencer, C. C. Handy, all of Wanseon, Ohio; C. C. Handy, attorney, Wanseon, Ohio.

Baldwin, Wis.—The Baldwin Telephone Company has filed articles of incorporation and elected the following officers: President, Dr. George Martin; vice-president, George Pittman; secretary, C. N. Gorham; treasurer, Frank Settergren; directors, Messrs. Martin, Pittman and Charles Settergren. This is a local exchange and will be completed in three months.

STREET RAILWAY NEWS.

Seattle, Wash.—On the application of W. J. Grambs, receiver for the West Street & North End Electric Company, Judge Hanford has made an order summoning the creditors of the company to present their claims on or before October 1.

Clarkesburg, W. Va.—The Fairmont & Clarkesburg Electric Railway Company has been incorporated by Ex-Senator Johnson N. Camden, of Parkersburg, and others, for the purpose of building an electric railway from Clarkesburg to Fairmont. The capital stock is $100,000.

Huntington, W. Va.—The Ohio Valley Electric Railway Company, with a capital of $1,000,000, has filed articles of incorporation. The company is organized to operate a road from Huntington, W. Va., to Ironton, Ohio. Thomas J. Ryan, H. S. Calo and others, incorporators. Huntington, W. Va., is the principal place of business.

NEW YORK NOTES.

HENRY W. PEABODY & COMPANY, shipping export and import commission merchants, of 17 State street, desire to obtain the names and addresses of good makers of the following electrical apparatus: For hardening metals in an electrical way; for removing the hair from animal hides by electricity. All replies should be addressed to the catalogue department.

TO BATTERY MANUFACTURERS.

The Bank of Renova, Renova, Pa., wants the names and addresses of manufacturers of dry and wet batteries for running fans, with a view to becoming selling agent for allotted territory.

NO TROUBLE TO TRAVEL.

Mrs. Dayton, 85 years, is going to take a trip to Auburn to visit her son. We said to her, "Mrs. Dayton, should think that quite a journey for a girl of your age. Don't you dread it?" "Why no!" said she. "Would just as liv ride on the New York Central as to set in an easy chair in your parlor. I never have any trouble. I have been over the road many times; when I get to Albany I always tell the old fellow at the door where I want to go and he looks out for me, and everybody on the train is always so courteous and obliging—traveling on the Central is no dread to me."—The Millerton Telegram.

ELECTRICAL WORKS IN GERMANY.

Conul-General Guenther writes from Frankfort: "According to the Electro-Technical Gazette, German electrical works show great increase. On March 1 last, there were in operation 652 electrical works, against 489 the previous year. One hundred and twenty-one works were in progress of construction, of which 17 were to be ready for operation on July 1. Twenty-seven of all the works were completed before 1890; all the others were constructed within the last ten years. The number of places with electric light exceeds that of places illuminated by gas—900 against 850. The largest electrical plant is at Rheinfelden, with 12,360 kilowatts. Then follow one at Berlin, 9,230 kilowatts; one at Hamburg, 7,290 kilowatts; one at Munich, 6,110 kilowatts; two others at Berlin, of 5,452 and 5,312 kilowatts, respectively; one at Strassburg, 4,955 kilowatts; two others at Berlin, of 4,676 and 4,655 kilowatts, respectively; one at Chorzon, 4,310 kilowatts; one at Frankfort, 4,152 kilowatts; one at Dresden, 3,580 kilowatts; one at Stuttgart, 3,208 kilowatts; and another at Hamburg, 3,150 kilowatts. All the electrical works supplied last year 2,623,893 incandescent lamps, 50,070 arc lamps, 106,368 horse power for electromotors, etc."

TEN GREATEST AMERICAN RAILROADS.

A table showing the mileage controlled by the principal railroad companies of this country on July, 1900, has been compiled by the Railway Age. The ten largest systems are as follows:

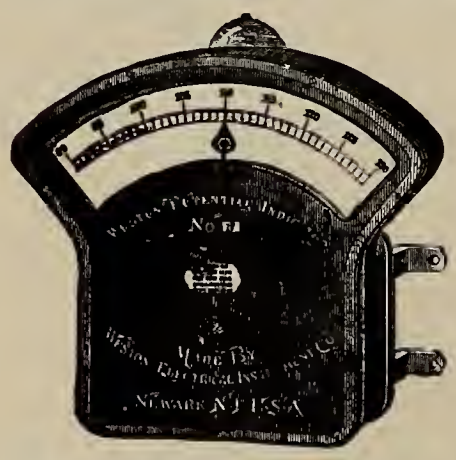
New York Central	10,430
Pennsylvania	10,392
Canadian Pacific	10,018
Southern Pacific	9,362
Chicago and Northwestern	8,463
Chicago, Burlington and Quincy	8,001
Southern Railway	7,887
Atchison, Topeka and Santa Fe	7,880
Chicago, Milwaukee and St. Paul	6,437
Union Pacific	5,584

LITERARY NOTE.

The third edition of "The Web of Life" is on the press. While the people of Chicago have resented the use which Mr. Robert Herrick has made of them as "dramatis personae" the general impression is that he has given a close description of American ideals as exemplified by a certain class of prosperous western people. It is perhaps natural that critics on the Atlantic coast are jubilant over Mr. Herrick's story, and this may possibly be the cause of the Chicagoans' resentment. The Macmillan Company have in hand also a fourth edition of William Stearns Davis's "A Friend of Caesar." It is very seldom that a book by an entirely unknown writer achieves such a success in so short a time. It is now well on its way towards its tenth thousand, and is being dramatized by a well known playwright.

WESTON STANDARD ILLUMINATED DIAL

STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

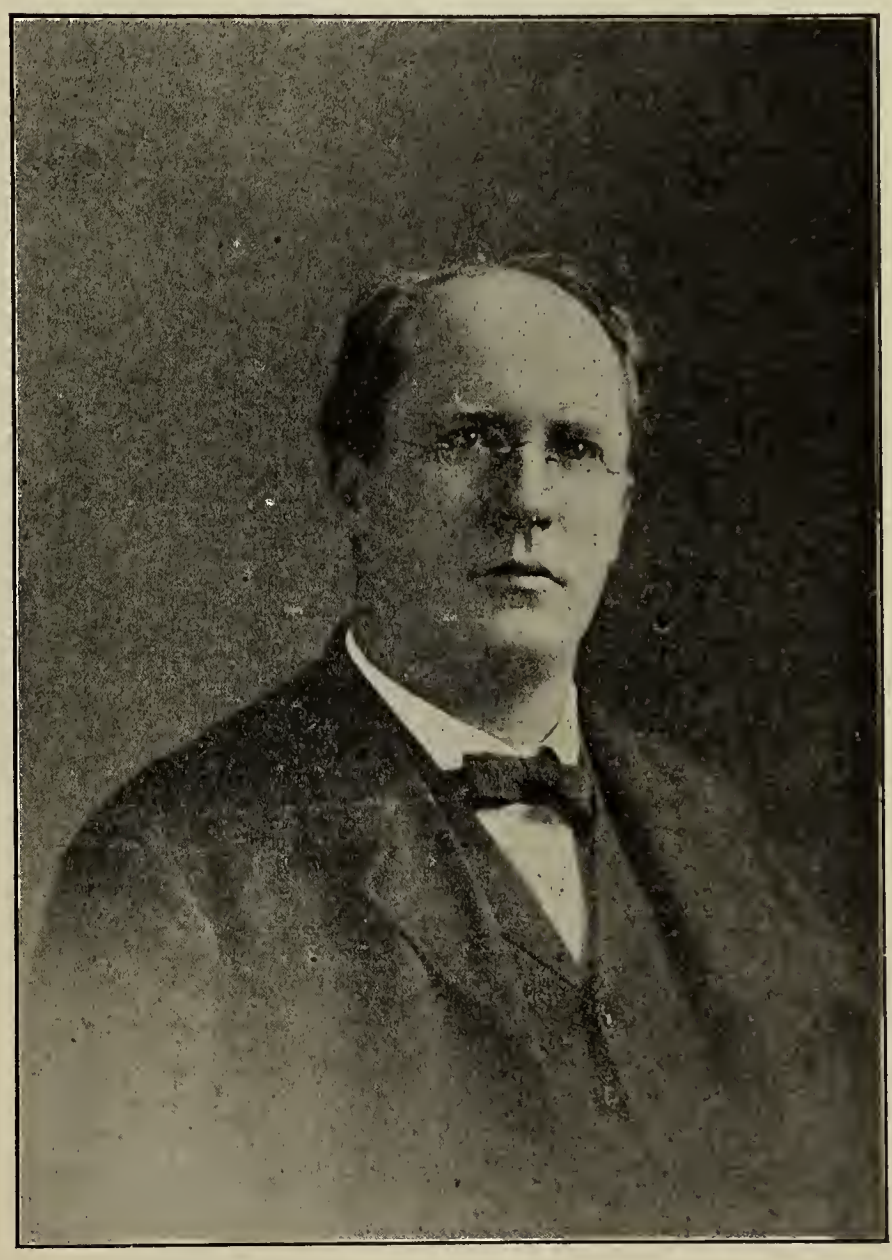
114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 11. NEW YORK, SEPTEMBER 15, 1900. Whole No. 696.

Biographical.



Walter K. Freeman.

WALTER K. FREEMAN.

A master of any profession must possess the power of concentration of mind; he must be a true student, willing to sacrifice all the pleasures of life to reach the hidden mysteries and intricacies of his chosen art. There are few men in America to-day who deserve more credit than Walter K. Freeman; certainly there are few men who have sacrificed so much as he in the cause of a chosen profession. His many years' contest and final victory in the litigation of the transformer system of electric lighting was sufficient to distinguish Mr. Freeman as a man of marked ability. It is conceded to-day by those who were most formidably arrayed against Mr. Freeman in 1896, when the transformer electric lighting case was waging fiercely, that he proved himself deserving of all the glory attending the discovery and reduction to practise of the alternating current system of electric lighting. Walter K. Freeman, Ph.D., C.E., A.B., is a descendant of one of the old Holland settlers of New York, a son of Benjamin Freeman and Elizabeth Dennison, daughter of Captain Dennison of Revolutionary days. He was born at Saratoga, N. Y., Christmas morning, 1859, and began his career as an engineer in 1878 at Racine, Wis., and eventually became general director of electrical and mechanical affairs of the Fort Wayne Electric Corporation, of Fort Wayne, Ind., subsequently absorbed by the General Electric Company, of New York. Recently the

eminent authority on patent law, Frederick P. Fish, counsel for the General Electric Company, speaking of Mr. Freeman, says: "He is a genius. His abilities are remarkable." One of our contemporaries, speaking of Mr. Freeman, says: "In these days of premature enthusiasm and excitement it is refreshing and inspiring to find a man who gives thoughful and dispassionate study to the problems that on all sides confront the inventor." Mr. Freeman is at work continually on a great variety of devices and employs a corps of nine skilled draughtsmen who are busy perfecting apparatus under Mr. Freeman's personal supervision. His staff of assistants are all college graduates. On no occasion, when acting as associate engineer, has his opinion been antagonized or an adverse judgement rendered upon a report of his by any engineer of standing. As a mechanical expert, conscientious worker and business man he is held in high esteem by all who know him. Mr. Freeman occupies a large suite of offices in the Park Row Building devoted to the purposes of consulting engineering in relation to electrical and mining projects. His experience as an engineer, stretching over the most interesting period in the history of the development of electric lighting and power transmission will be found peculiarly valuable to those requiring an expert's opinion.



F. C. Mason, Sup't. Police Telegraph, New York, (Borough of Brooklyn) First President and Founder of the International Association of Municipal Electricians and Member of the Executive Committee.



Morris W. Mead, Superintendent of the Bureau of Electricity Department of Public Safety, Pittsburgh, Pa.; Chairman of the Executive Committee and First Vice-Pres. of the Original Association.

Conventions.

MEETING OF THE INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.

Over 1,000 delegates and visitors are reported as coming to the fifth annual convention of the International Association of Municipal Electricians, which is to be held in Pittsburg September 25, 26 and 27. Mr. Mead, the chairman of the executive committee, reports that big delegations are coming from New York, Boston and other Eastern cities. Electricians in all parts of the country and their friends will attend. J. P. Barrett, for twenty-five years chief of the electrical bureau of Chicago, will be Mr. Mead's special guest. The association of old-time telegraphers will hold its annual convention in Minneapolis a week before the convention here, and two carloads of delegates to the Minneapolis convention will stop over in Pittsburg and participate in the exercises here. Arrangements have been made for a fine electrical display by the city in Schenley park on Saturday evening, the 24th, at which the picture of George Washington and a number of electrical machines will be shown in incandescent lights.

In Mr. Mead's letters of invitation sent to city electricians and others interested in electrical affaris, he says: "The enormous increase of electric appliances and methods make it essential that the fraternity keep posted up to the time in all such matters. The discussion of practical subjects relating to the betterment of the municipal electrical control, as well as the personal acquaintance formed and the interchange of ideas, creates a development of these matters that are of mutual advantage and can be obtained in no other way. This city being the headquarters of many of the greatest electrical developments of the age, I feel that the time devoted will be profitable and of the greatest advantage to all."

Fillmore, N. Y.—The Fillmore Telephone Company, of Fillmore, Alleghany County, has been incorporated. Capital, $5,000; directors: Chas. Ricker, Wm. S. Mills and John H. Howden, of Fillmore.

Incandescent Lamps.*

BY FRANCIS W. WILLCOX.

(Continued from page 75.)

THE WIDENED FIELD OF LAMP USE, ETC.

An entirely new and broad field was opened to lighting with the birth of electric light. Previously there was merely light—with electricity came illumination. Before the dynamo, light was used simply for necessity—hand in hand with the incandescent bulb came lighting for display, for ornament, for attractive effects.

The beautiful lighting display of the World's Fair, or more recently of the Omaha Exposition (the latter the most beautiful and best example of incandescent illumination the world has ever known), are a development and result made possible only with the electric light.

The adaptability of electric light and the special effects and results possible produced numbers of special applications which are well illustrated in lamps by the numerour special types now available. The first lamps were simple, plain multiple lighting lamps of about 13 candle-power. The first extension was into other candle-powers, such as the 32, the 50, the 100 and 150 and even 300 candle-power. Then the coloring and frosting of the glass gave a variety of effects. Next followed the miniature lamps. The first of these were battery lamps, made in 1883, for decorative lighting, at a Vanderbilt ball in

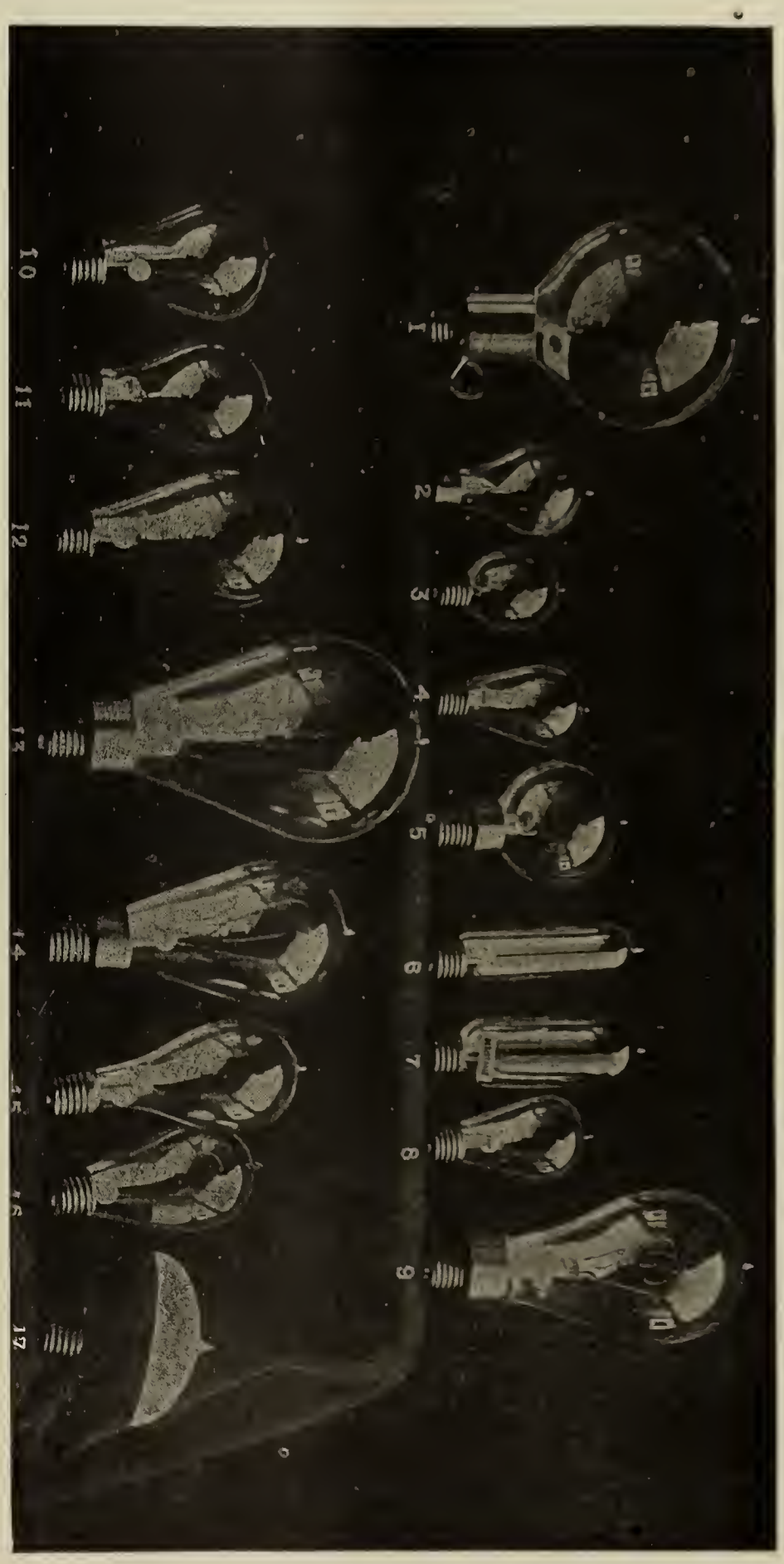


PLATE II.—Types of Standard and Special Multiple Lighting Lamps.

1—Lamp for buoy lighting.
2—European lamp.
3—Round bulb lamp.
4—10 c. p. 100-125-volt lamp.
5—Stereopticon lamp, 50 c. p.
6—Tubular lamp.
7—Resistance lamp.
8—4 c. p. 100-125-volt lamp.
9—Diving lamp.
10—Standard 16 c. p. 100-125-volt lamp.
11—Standard 16 c. p. U. S. N. cruiser lamp, 80-volt.
12—Standard 32 c. p. 100-125-volt lamp.
13—Standard 100 c p. lamp.
14—Standard 50 c. p. 100-125-volt lamp.
15—Old style lamp. Free blown bulb.
16—10 and 16 c. p. 50-volt lamp.
17—Reflector lamp.

*Read before the Franklin Institute.

New York. A large field was opened with this type. We now have the surgical lamp used to illuminate the interior of a person's anatomy, the dental lamp, the microscope lamp, the kinetoscope lamp, the bicycle lamp, the miner's lamp, the railway carriage lamp, and among the latest applications, the automobile lamp and the telephone lamp. This last is of special interest, and

¼ of a candle to 24 candles, in voltage from 3 to 45 volts, and in economy from 2½ watts per candle to 6 watts.

The unique character of miniature battery lamps for interior decorative effects prompted the production of miniature lamps that could be burned on the regular lighting circuits. These were produced to burn in series.

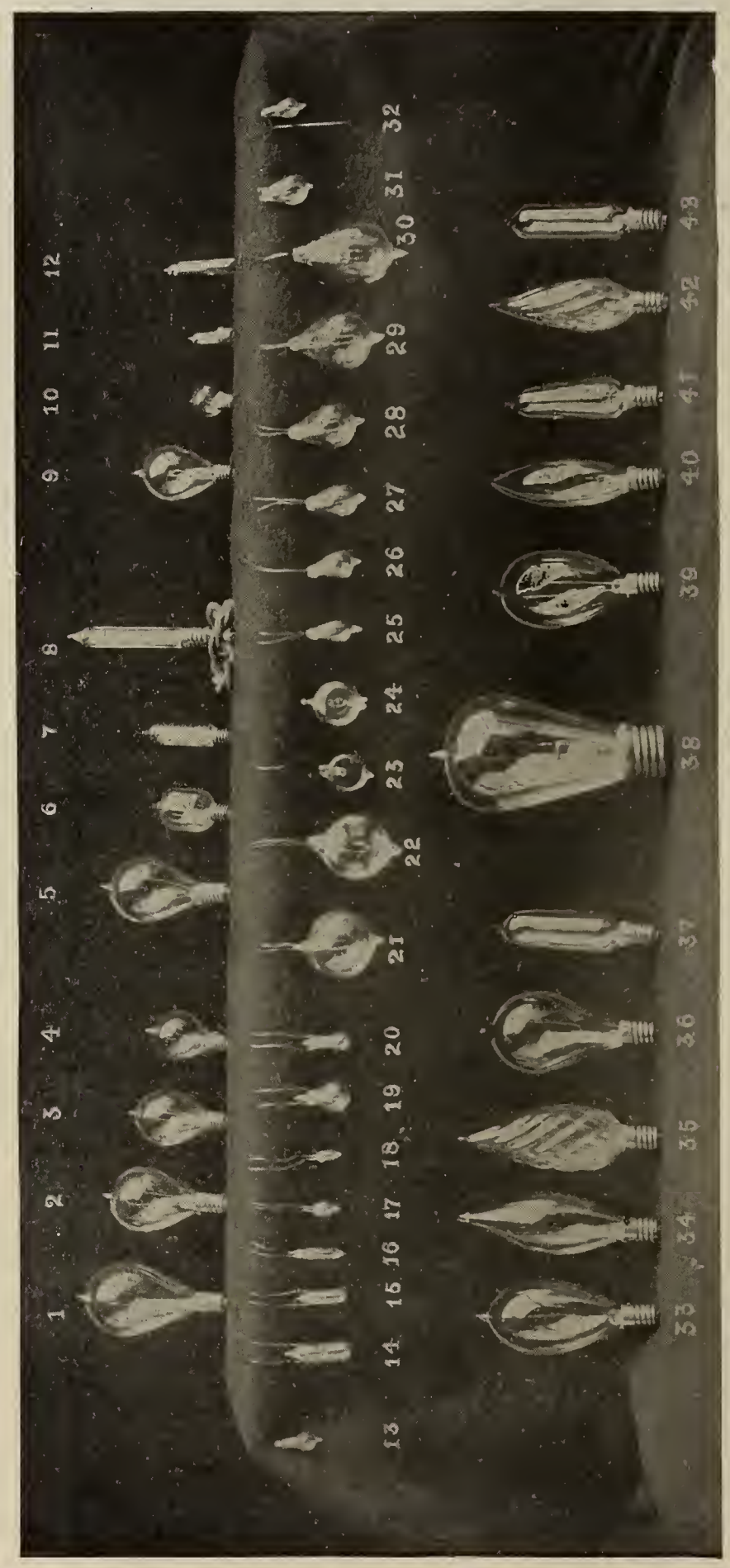


PLATE III.—Types of Miniature Lamps.

SPECIAL SERIES LAMPS.
1—8 c. p.
2—5 c. p.
3—3 c. p.
4—1 c. p.

U. S. N. LAMPS.
5—Binnacle lamp.
6—Instrument lamp.
7—Instrument lamp,
8—Torpedo lamp.

9—Kinetoscope lamp.
10—Bicycle lamp.
11—Telephone lamp.
12—Telephone lamp.
13—Watch charm lamp.

DENTAL LAMPS.
14—
15—
16—
17—Pea lamp.
18—Surgical lamp.

MICROSCOPE LAMPS.
19—
20—
21—4 c. p. spherical lamp.

FLAT LAMPS.
22—4 c. p.
23—1 c. p.
24—Miner's lamp.

MULTIPLE CANDELABRA LAMPS.
33—Style A.
34—Style B.
35—Style D.
36—Style E.
37—Style F.
38—Battery lamps for steam railway carriage lighting.

SERIES CANDELABRA LAMPS.
39—Style A.
40—Style B.
41—Style C.
42—Style D.
43—Style E.

BATTERY LAMPS.
25—½ c. p.
26—1 c. p.
27—2 c. p.
28—3 c. p.
29—4 c. p.
30—6 c. p.
31—Theatrical.
32—Stick pin lamp.

reveals the adaptability of the lamp to new purposes. To replace the sound or ear signal in telephone exchanges by the visual signal of a lighted lamp is a most original and valuable idea. These battery lamps are made in all shapes and sizes, pear-shaped, spherical and flat, from the size of the standard 16 candle down to the pea lamp, no larger than a fair-sized pea—in candle-power from

These are what are called the series miniature lamps, and are most widely used for candelabra lighting, for electric signs and for decorative effects, for interior and out-of-doors, among flowers and shrubbery, where a large number of units of light covering a large area are desired. The theatrical lamp, used for special stage effects and decorating dancers, is one of this class. They run in

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.
JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

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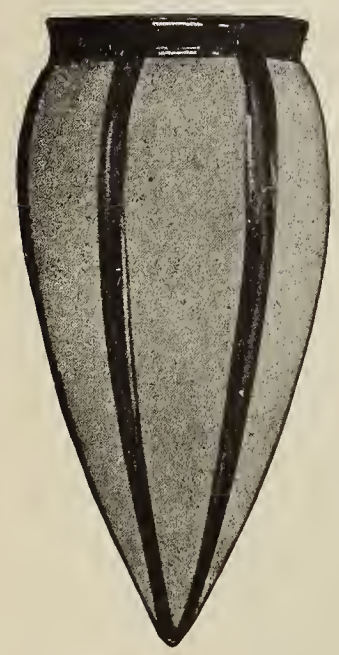
TELEPHONING WITHOUT WIRES BY MEANS OF ELECTRO-MAGNETISM.

The fascination the above subject has for many experimentalists is due to the great practical advantages that would result from the development of a commercial system. In addition, personal benefits in the way of fame and wealth are to be gained. The subject is intensely interesting although progress cannot be rapid when dealing with the ether, a medium of which so little is known. As a well known writer says: "If one critically examines the advances that have taken place in the applications of electricity one can see that even the practical man's chief consideration is in regard to the medium around his electro-magnets and his currents." It is to this that much attention has been directed of late; that is, the medium around electro-magnets and currents. In other words, the electro-magnetic manifestation surrounding a wire carrying a current is the key to the future solution of a problem that might be stated in the above terms, telephoning without wires by means of electro-magnetism. How shall we telephone without wires? How far may telephoning be carried on without wires? These are practical questions of everyday importance.

The present system of telephony, in which is employed the transmitter and receiver, is inherently electro-magnetic. The transmitter operates over a distant line through the aid of an induction coil. The receiver itself is an electro-magnetic device, representing in many respects an ideal dynamo. What is there foreign therefore in the idea that electro-magnetism may be employed for the purpose of dispensing with wires? It is admitted by telephone experts and, in fact, is well known to the general public that disturbances on telephone lines are frequently due to neighboring lines. These interruptions take the form of noises and on many occasions appear as distinctly ennunciated speech. With parallel lines connected to telephone systems it is not a difficult matter to speak across space for a considerable distance. The electro-magnetic waves from one line are transmitted to the other, producing within it induced currents and through the aid of telephonic appliances speech. which is an exact duplicate of that conveyed over the first line. In this case no electro-static phenomena of any importance are present. No Hertzian waves are employed but only a well known principle whose practical value is illustrated in such types of machines as the dynamo and motor, the Ruhmkorff coil, and even, according to the latest reports from abroad, in a newly invented phonograph, which dispenses entirely with the use of wax and employs instead a cylinder of steel. A system of wireless telephony can become an accomplished fact for a moderate distance of from one to two miles and may, with the aid of amplifying apparatus or a system of relays, situated at the proper intervals, carry speech over the breadth of a continent.

At a meeting of the British Association for the Advancement of Science Sir William Preece delivered a paper covering a series of tests made by himself in wireless telephony. In 1894 he spoke over a distance of a mile and a half on Scotch ground through the use of parallel wires. His next experiments were across the Menai Straits where the extremities of the parallel wires ended in plates which dipped into the sea. Communication was afterwards established between Anglesy and a collection of islands known as the Skerries. Speech was successfully transmitted in this case over a distance of nearly three miles. Subsequently another series of parallel wires were erected through which speech was transmitted between North Coast Island and the mainland, the distance in this case being a full four miles. In the face of these facts no denial can be made of the solution of the problem of wireless telephony which, though operating but a limited distance, is in itself more wonderful than wireless telegraphy. It is suggested by Preece that vessels be equipped with systems of the above character for obvious reasons. It must be understood, however, that the broadest applications of this principle are not as yet possible as interference and confusion would inevitably result were too many signals sent in the same direction at once, that is, from different operators. It is strange to realize that before the final touch has been given to complete our present system of telephony, namely, the invention of a telephone repeater, a new system is launched into being which may entirely remove the need of this long looked for device.

The phenomena of electro-magnetism compel us to assume the existence of a medium through which. and by means of which, the electrical energy is transmitted. In the case of electro-magnetism we observe that certain lines of force are established in the space around magnets and around wires carrying currents. While these lines are being established work must be done on the medium and energy is stored up in the medium. When the lines of force are withdrawn from the medium the energy that was stored up now rushes into the wire of the circuit of the electro-magnet and is dissipated as heat.—John Trowbridge, S. D., Harvard University.





















Samples of the Phoenix Glass Company's Shades and Globes.

8182
6581

80691/2
8177 1/2

80701/2
5821

80701/2
80291/2

6965
6644

candle-power from 1 to 10 candle-power, and in various shapes, the twisted flame effect, the tubular, conical, bean-shaped and pear-shaped.

Series lamps, burning on regular lighting circuits, have of late years been a thorn in the side of the underwriters, and their rules and restrictions have resulted in the production of candelabra and miniature lamps adapted to burn in multiple on regular 100-125-volt circuits. This was quite an achievement in lamp manufacture, for many years considered impossible. Such lamps are in successful use, and to-day they have enlarged the field and application of miniature lamps and sign lighting.

A bank of incandescent lamps has always served as an excellent form of resistance. This has resulted in the production of the resistance lamp, a type largely used in connection with telegraph work. They are made of any desired resistance up to 1,000 ohms cold resistance for use with moderate currents, and are placed in tubular bulbs so as to minimize space. The desirability of having a lamp that could be turned down brought on the Edison night lamp, in which two filaments burn in series to give a dim light of about 1 candle. By the turn of a small thumbscrew, one of these filaments is cut out and the other burns at full 16 candle-power.

For stereopticon work the incandescent lamp is particularly well suited. A special lamp has been designed for this work, having a compact filament wound so as to make as near as possible a center or point of light. These are made standard at 50 candle-power, but higher candle-powers are obtainable.

For examining cask interiors, brewers and barrel cleaners require a long thin lamp that they may thrust through the bunghole and light up the interior of a cask. Hence the tubular or bunghole lamp, which is useful for confined or narrow places. It has recently been adapted with considerable success for lighting the interior of counter showcases.

In decorative work, lighting show windows, etc., a short bulb is frequently desirable, and this has produced the round bulb type.

The buoys of New York Harbor are lighted by electricity, and for this work a special type of lamp was devised with permanent wire connections made through a watertight dummy base.

The United States navy requires a number of special types. All the regular Navy Cruiser lamps are 80 volts, and in special shaped bulbs. Then there is the navy signal lamp, a small lamp designed for quick lighting and extinguishing for signal work at night; also the torpedo lamp, instrument lamp and binnacle lamp. Unique and most interesting is the navy diving lamp, for use under water by divers. This is made of speecially heavy thick glass, and protected from any damage by water or shock.

The European lamps are made in much smaller bulbs than are standard lamps in this country, so for the foreign trade a new lot of specialties are required.

The adoption of electricity for street railways has made a large demand for a type of lamp suitable for car lighting and running in series on the 500-volt railway circuit.

One of the latest and most interesting lamp specialties is the reflector lamp. This is made in a pumpkin-shaped bulb, of which the top side is covered with a silvered coating forming a perfect reflector. This makes a lamp of special value for a reading or desk lamp, or wherever the use of reflectors is required. The candle-power is concentrated in one directior to a threefold degree. Thus a normal 16 candle-power lamp in this special type will give about 50 candle-power in a downward direction.

Let us sum up and see how many varieties of lamps are required from the lamp manufacturer to-day.

In regular multiple lamps we have nine different candle-powers, and three different economies, and at least six different bases. Here are 162 types. In voltages we have at least fifty regular types, which multiplies the number of types to 8,100.

These may be frosted, or any color—red, blue, green, amber or opal, which multiplies results by six, giving 48,600 types	48,600
Now taking the round bulb we find varieties are.	21,000
The tubular	21,000
Stereopticon	900
Resistance lamp (at least)	1,000
Multiple candelabra	500
Series candelabra	500
Special series (about)	500
Regular battery	40,000
Special battery (at least)	500
Navy lamps (about)	100
Foreign lamps (about)	10,000
Reflector lamp (about)	2,000
Night lamp (about)	400
Series lamps for alternating and arc circuit	100
Total	147,100

From the above we see the immense increase of types caused by the specializing of any one feature; for example, a special bulb, a special shape of filament, or a special efficiency. In regular multiple lighting lamps, we add a thousand or more types with each change to specials.

(To be continued.)

Electric Light Appliances.

REOPENING OF THE WORKS OF THE PHOENIX GLASS COMPANY.

The works of the Phoenix Glass Company, of Pittsburgh, at Monaca, Pa., were reopened on August 27th under more favorable auspices than ever. The business on hand at the reopening shows a marked increase over that of any previous period, the demand being mainly for the finer grades of etched and opal glassware for incandescent and enclosed arc lamps. The growing demand for Phoenix glassware reflects great credit upon the excellent business management and foresight of the New York office, which is in charge of the vice-president and general manager of the company, Mr. A. H. Patterson. We show herewith a few samples of the Phoenix Company's newest designs in etched electric, gas and arc globes, shades, etc. Their latest catalogue, No. 11, contains forty-two pages of illustrations of their latest designs and will be sent free upon application.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED AUGUST 28, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

656,635, 656,636. Electric motor suspension. Geo. Gibbs, Philadelphia, Pa.

656,650. System of electrical distribution. Alex D. Lunt, Schenectady, N. Y.

656,651. Method of treating porous material used for electrical purposes. W. A. Markey, Saginaw, Mich.

656,652. Carbon brush. W. A. Markey, Saginaw, Mich.

656,672. Animal-releasing device. F. A. F. Sprenger, Chicago, Ill.

656,680. System of electrical distribution. E. Thomson, Swampscott, Mass.

656,681. Circuit breaker. E. Thomson, Swampscott, Mass.

656,700. Battery box. L. W. Pullen, Camden, N. J.

656,703. Telephone system. F. G. Rugh, Briar Bluff, Ill.

656,716. Fluid-operated electric switch. C. A. Eck, Newark, N. J.

656,744. Device for lighting lamps by electricity. S. M. Meyer, New York, N. Y.

656,780. Lightning arrester. W. E. Athearn, New York, N. Y.

656,796. Signal receiving relay. G. K. Thompson, Malden, Mass.

656,806. Alternating-current generator. C. S. Bradley, Avon, N. Y.

656,821. Means for controlling energy delivered to electrical translating devices. H. W. Leonard, New York, N. Y.

656,828. Telautographic apparatus. Foster Ritchie, London, England.

656,832. Telegraphy. H. D. Bartholomew, Newark, Ohio.

656,840. Protector for electric lamps. F. B. Garretson, Worcester, Mass.

656,870. Electric switch. R. H. Wappler, New York, N. Y.

656,882. Charging stand and contact for storage batteries. G. H. Condict, New York, N. Y.

656,907. Telephone signaling appliance for party telephone lines. J. Steiner, New York, N. Y.

656,930. Electric furnace. Wilhelm Borchers, Aix-la-Chappelle, Germany.

656,940. Engraving machine. C. Chevalier, New York, N. Y.

656,962. Means for securing pole pieces. H. Geisenhoner, Schenectady, N. Y.

656,972. Electric motor. E. A. Henry, Crestline, Kas.

656,977. Electric lamp for miners' use. Leo Horwitz, Berlin, Germany.

656,982. Electrolytically treating scrap-iron. E. D. Kendall, New York, N. Y.

656,996, 656,997. Telephone. F. R. McBerty, Evanston, Ill.

657,012. Apparatus for electrolysis. P. Schoop, Wildegg, Switzerland.

657,020. Portable electric lamp. F. W. Brooks, Washington, D. C.

657,032. Apparatus for electrolyzing ores. A. M. Rouse, Denver, Colo.

657,046. Multiple-motor system for automobiles. J. Trier, Chicago, Ill.

Business News.

NEW INCORPORATIONS.

New York City.—Challenge Incandescent Manufacturing Company, of New York; capital, $6,000; directors: Morris Kamber, Benjamin Fox and Jacob Hirshberger, New York city.

New York City.—The Barker-Moyer Company, of New York city, has been chartered to do electrical contracting; capital, $10,000; directors: W. A. Barker, Newark, N. J.; C. O. Moyer and W. P. Dewey, Jr., New York city.

New York City.—Heniskayuna Power Company, of New York city, to develop hydraulic and electrical power; capital, $100,000; directors: Ernest C. Brown and L. J. Montgomery, New York city; W. A. Graves, Rexford Flats.

Peekskill, N. Y.—An amended certificate of incorporation of the Peekskill Lighting Company, to form the Peekskill Lighting and Railroad Company, has been filed. The company will operate, in addition to its lighting and power plant, an electric railroad 25 miles long in Westchester County.

Sidney, N. Y.—A certificate of incorporation of the Susquehanna Valley Electric Company, was filed recently; capital stock, $200,000. Its objects are stated to be the manufacture of power and light; five directors are named, all residing on Long Island; but the corporation is to carry on business in Sidney and Franklin. This action revives talk of the Sidney-Franklin trolley road.

TELEPHONE CALLS.

Monticello, N. Y.—Monticello Telephone Company, of Monticello; capital, $2,000; directors: Martin La Tourette, E. H. Strong and D. S. Yeoman, Monticello.

STREET RAILWAY NEWS.

Wilmington, Del.—The Newark & Granville Street Railway Company, of Newark, Ohio, has been incorporated with a capital of $300,000.

Wilmington, Del.—St. Mary's Terminal Company, of Baltimore, to erect buildings and construct railways and transportation facilities; capital, $500,000.

Kingston, N. Y.—Peckham Manufacturing Company, of Kingston, to manufacture motors, car trucks, and wheels; capital, $500,000; directors: James H. Everett, V. B. Van Wagener and Hewitt Boyce, Kingston.

NEW YORK NOTES.

PALMER & OLSON, 210 Centre street, electrical engineers and contractors, repair and reconstruct dynamos and motors, renew commutators and armatures of all makes and will be pleased to quote cost of reconstructing any style or make of electrical apparatus. They also install complete plants for isolated lighting or power work. Motors and dynamos put up on short notice. Street railway and electric light station repairs and supplies a speciality. Messrs. Palmer & Olson have every facility for special work of all kinds—from the designing and building of storage batteries to the most intricate machinery.

CHARLES BUECK, 211 Centre street, is making a speciality of electric sign letters in plain and fancy designs. He will furnish drawings for electric light signs or figure on sketches submitted by prospective customers. Sign letters for the trade a specialty.

HERBERT E. PLASS, of the H. E. Plass Electric Supply Company, 21 Barclay street, manufacturers of the newest and most practical electrical novelties, has started on a five weeks' trip through the West. It will pay buyers to call and inspect the Plass Company's line of electrical novelties, etc.



WESTON STANDARD

PORTABLE DIRECT READING

VOLTMETERS

AND

WATTMETERS

For Alternating and Direct Current Circuits.

The only standard portable instrument of the type deserving this name.

Write for our Catalogue of Portable Instruments.

WESTON ELECTRICAL INSTRUMENT CO.,

114-120 William Street, Newark, N. J.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 81.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 12. NEW YORK, SEPTEMBER 22, 1900. Whole No. 697.

Conventions.



Capt. Wm. Brophy, of Boston, Mass., President of the International Association of Municipal Electricians.



Morris W. Mead, Superintendent of the Bureau of Electricity, Department of Public Safety, Pittsburgh, Pa.; Chairman of the Executive Committee and First Vice-Pres. of the Original Association.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.

The fifth annual meeting of the International Association of Municipal Electricians, to be held at Pittsburgh, September 25, 26 and 27, will meet at the Monongahela House. Delegates and visitors will be accommodated there at $3 and $4 per day, American plan; those desiring European plan can be accommodated at the Griswold Hotel at $1 per day and upward; at Newell's Hotel, Henry Hotel, Lincoln Hotel, Duquesue Hotel, Schenley Hotel for $2 a day and upward; also at the Seventh Avenue Hotel and Anderson Hotel, American

plan, $3 a day and upward.

There will be two sessions daily, at 9.30 a. m. and 2.30 p. m., respectively. The sessions will be held in the banquet hall of the Monongahela, where conventions have been held for the last fifty years. Papers on the following subjects will be read and discussed: "Benefits to be Derived from Our Association," by Capt. Wm. Brophy, chief electrician Wire Department, Boston, Mass.; "Contact Points," by Frank C. Mason, superintendent of Police Telegraph, Brooklyn, N. Y.; "Trials and Troubles of Instituting and Enforcing Municipal Inspection and Control," by W. G. Canfield, superintendent Fire Alarm Telegraph, Grand Rapids, Mich.; "Automatic Fire Alarm Systems," by Charles Burger, manager Boston Thermostatic and Automatic Fire Alarm Co., Boston, Mass.; "Advantages and Disadadvantages of Carrying High and Low Potential Conductors Upon the Same Poles." This subject will be presented by an able electrician for general discussion.

The local entertainment committee, consisting of Elmer Loomis, J. G. Splane, J. D. Flynn, L. Lemon, Joseph Haeveler, A. C. Dinkey, Chas. McVail, John H. Reid, Dr. J. C. McNeil, John C. Henry, Morris W. Mead, Richard McClatchey, John W. Moreland, Henry L. Auglach, Charles Fraelich, William S. Bradley, Robert Rosemund, J. A. Herron, Henry Hemenhouse, James A. Gorman, John D. Dennison, H. M. Thomas, John W. Cupps, Thomas Hannan, Charles S. Eaton, William Laughrey, Frank A. Cupps, Eugene Ingald, Frank Orbin, A. B. Laughlin and Christopher L. Magee, Jr., have laid out a programme which includes trolley rides, carriage drives, theatre parties, excursion down the Ohio river and inspection of the large iron and steel mills. So far as possible arrangements will be made for members who desire to inspect the works of the Westinghouse Companies at East Pittsburgh and Wilmerding and of the Standard Underground Cable Company.

The officers of the association are William Brophy, president; G. F. McDonald, vice-president; Adam Bosch, treasurer; Geo. H. F. Cottell, secretary; Burt C. McAllister, financial secretary. Executive Committee: Morris W. Mead, chairman; W. Y. Ellett, J. W. Aydon, F. G. Baya and F. C. Mason.

Electrical Specialties.

THE ODDO JUNIOR.

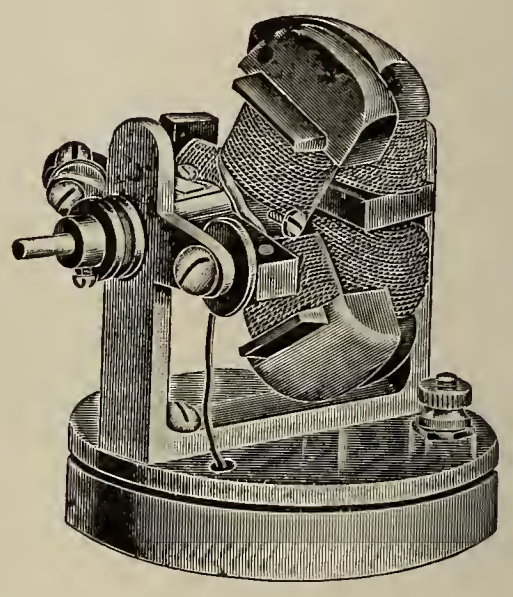
The Oddo Junior is a very remarkable electric motor, possessing features that give it prominence over all other types of its size and weight on the market. Scientifically constructed, all of its magnetism develops torque and, in addition, through the medium of the arms of the armature a degree of leverage is brought into play, making it the one superior type on the market. Efficient in a mechanical sense through the use of long lever arms, efficient in an electrical sense through the comprehensive utilization of all its magnetism to produce a rotatory force it represents the ne plus ultra of its kind. It weighs but eleven ounces and operates at a high rate of speed with one dry cell.

Although but a small motor it possesses many qualifications that make it technically interesting, as above outlined, which have been admitted by many authorities. The pull developed by this little motor through the employment of the principle of leverage is surprising, particularly in connection with the fact that it is beautifully finished and costs but one dollar, mailed to any part of the United States or Canada.

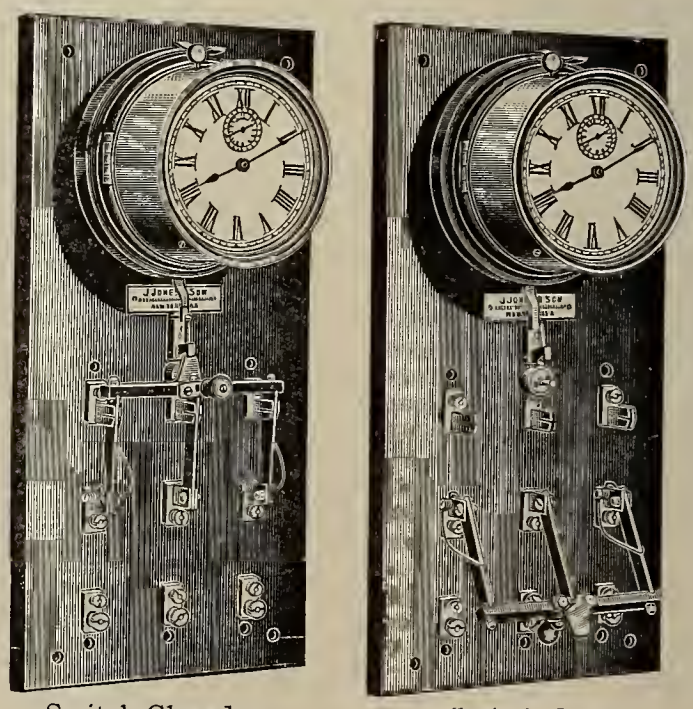
The above motor is manufactured by the American Oddity Company, 170-172 West Broadway, New York city.

THE JONES SWITCHBOARD AND AUTOMATIC TIME CUTOUT.

The firm of J. Jones & Son Company, 64 Cortlandt street, New York city, have placed upon the market a line of switchboards, panel boards, etc., of their own construction, of a style of workmanship and design that has won admiration from all sides. They have supplied many large buildings and apartment houses with their switchboards entirely on their own merits both as regards finish and price. The standard specifications are met with in every respect in relation to this class of work. In addition their ownership of patents covering special methods of construction gives their switchboards great prominence. Their switches as well as switchboards are exceedingly popular with contractors and are frequently required when specifications are drawn up of the electrical equipment of buildings. Proctor's Pleasure



The Oddo Junior.

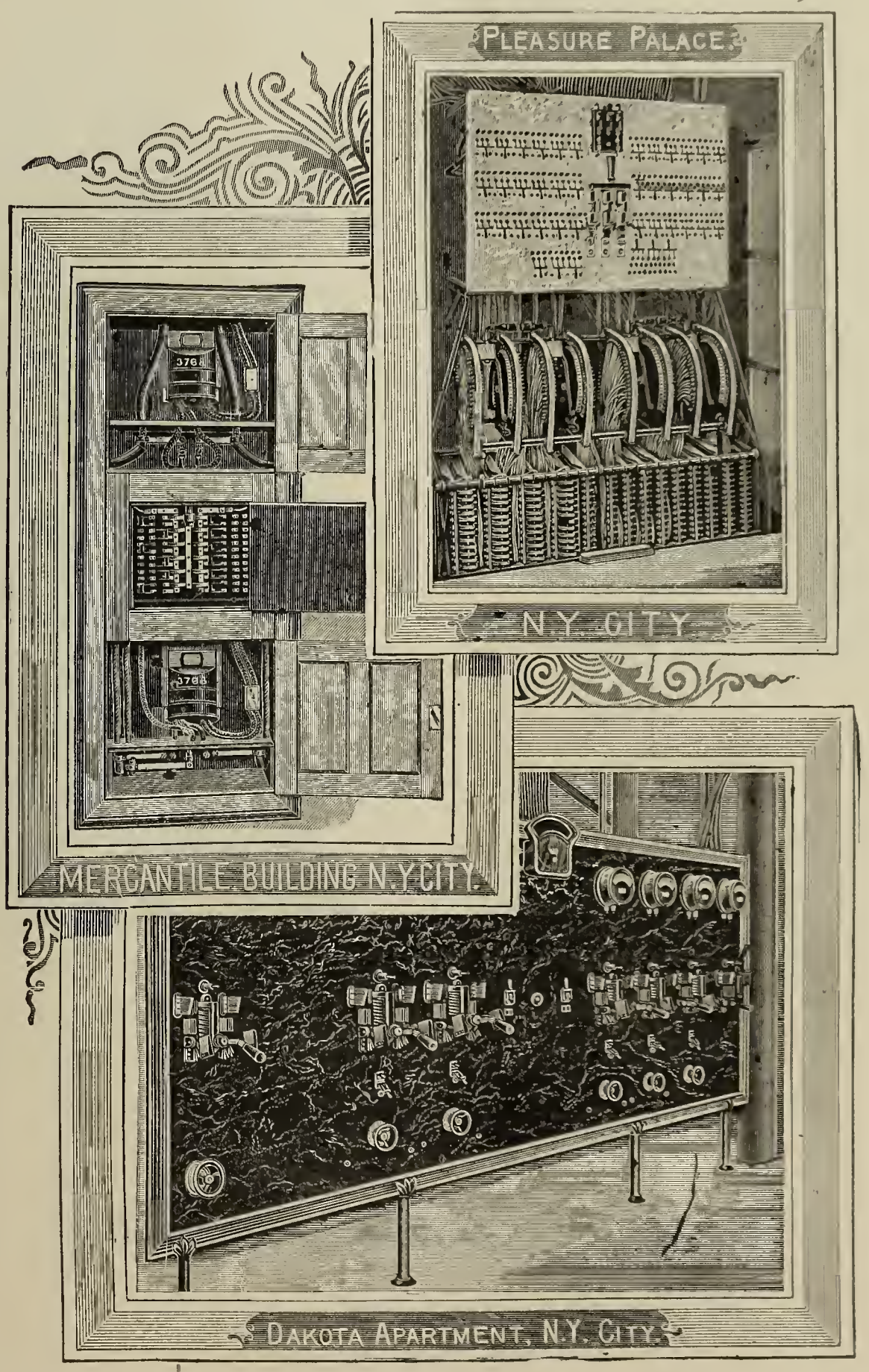


Switch Closed. Switch Open.

Jones Improved Automatic Time Cutout.

Palace, the Mercantile Building, the Dakotah flats and a variety of other large and important institutions have been fitted with the Jones switches and switchboards for two and three wire lighting and have given satisfaction in every respect.

vice. This improved automatic time cutout is low priced, simple in construction and thoroughly reliable. Its object is merely to open the switch at a set time, thereby cutting out the lights. Its advantages are obvious and the necessity for positive action likewise.



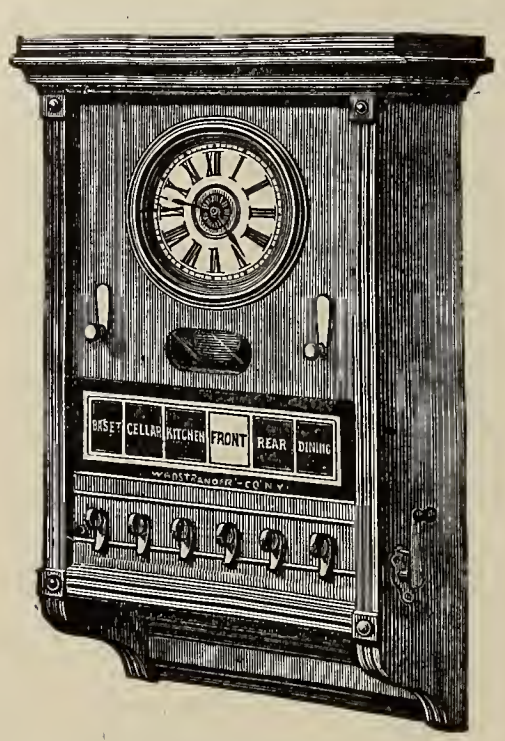
Some Switchboards Installed by the J. Jones & Son Company.

Their automatic time cutout, illustrated in the two cuts showing it open and closed, represents a device ingenious in construction, certain in operation and superior in every respect to the pseudo-types bearing the same name and inefficiently performing the same ser-

J. Jones, Jr., will attend the Pittsburgh convention of the International Association of Municipal Electricians. The above concern are up to date in all their specialties and through taking a personal interest in the latest improvements have rapidly forged to the front.

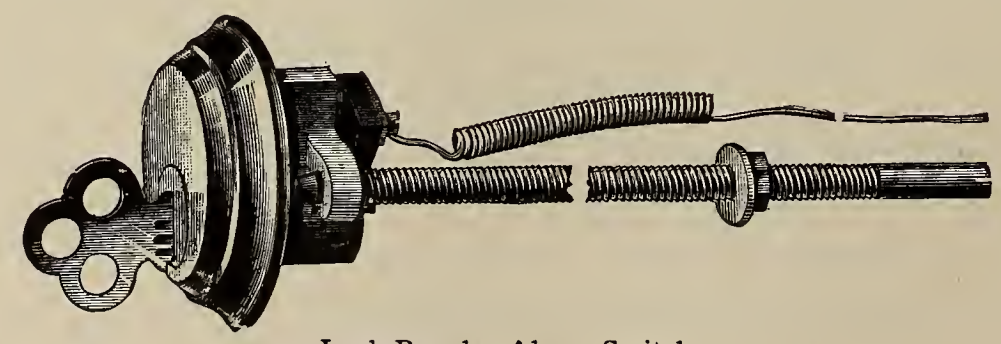
ELECTRIC ANNUNCIATORS AND BURGLAR ALARMS.

The supply house of W. R. Ostrander & Company, of 22 Dey street, New York City, an old and well established firm, have placed a line of annunciators and burglar alarm supplies upon the market of the most meritorious character. Their hotel annunciators are constructed in such a manner that there are no springs to get out of order and are not affected by jarring or vibration. They are made in sizes from twenty-five to forty and from forty to seventy-five, or, if necessary, from seventy-five indicators upward. The cases are highly finished to



Improved Burglar Alarm.

match the surrounding woodwork in walnut, cherry, oak, etc. Their improved burglar alarms met with great success, particularly the style B, supplied with annunciator, silent indicator, constant ring, cut-off, and clock. The advantage of this clock is that it will connect automatically any portion of the house desired for two and one-half hours and through its medium a bell placed in the second story hall as a rule will be rung and heard all over the house. The lock burglar alarm switch is an ingenious contrivance, composing both a lock and a

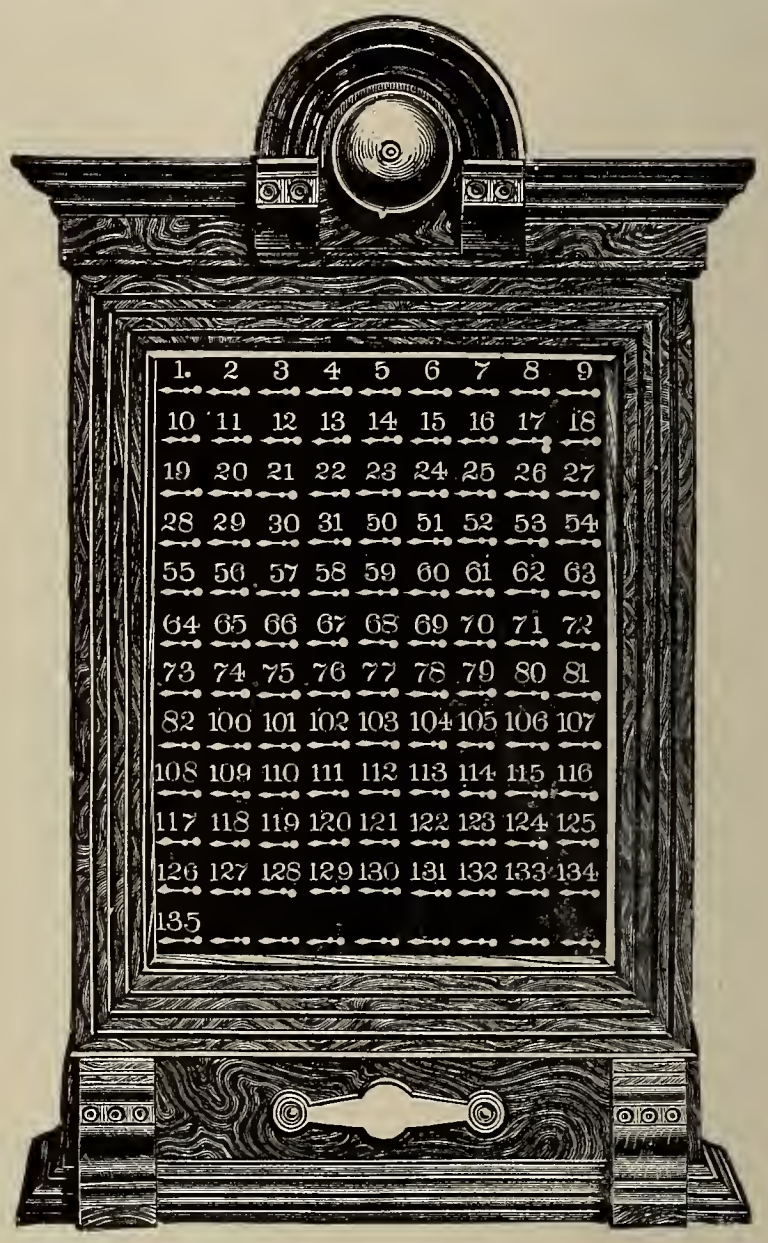


Lock Burglar Alarm Switch.

burglar alarm. Other than the proper key will ring the alarm whereas those supplied with the right key can go in and out the building without ringing the bell. These switches are placed in connection with burglar alarm systems in private residences, the doors of shops, warehouses, etc., and are finished in bronze and nickle at a moderate price. The large factory of the concern may be found at 1433-1435 DeKalb avenue, near Knickerbocker, Brooklyn, N. Y.

THE MANHATTAN ELECTRICAL SUPPLY COMPANY.

The Manhattan Electrical Supply Company, of 32 Cortlandt street, New York city, was organized way back in the '80s by Messrs. Johnson and Gorman, old time telegraphers. Being thoroughly acquainted with the demands of the trade the electrical supply house they founded meets all the calls made upon it for the best and latest class of supplies, specialties, etc., relating to electric lighting, telephony, bell work, telegraphy, etc.



Electric Annunciator.

The Mesco dry battery has won them fame all over the civilized world, the letters forming the name being derived from the name of the company. The Dittmar pocket battery gauge is almost exclusively used by electricians in testing batteries before setting them up. It is of the greatest service in locating a defunct cell, thereby saving the inspector time and money. Its cheapness and accuracy have made it very popular among the bell hangers. Their long distance telephone, finished in walnut, represents the latest features in modern telephones. Getting out of adjustment is almost impossible. The transmitter conveys the sound without defect or dis-

The Electrical Age.

ESTABLISHED 1883.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., } ELECTRIC LIGHT AND POWER.
OSBORNE P. LOOMIS, E. E., }
JOSEPH MUIR, M. D., } ELECTRO-
FREDERICK STRANGE KOLLE, M. D., } THERAPEUTICS.

NEW YORK, SEPTEMBER 22, 1900.

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AN ANSWER TO MESSRS. MARTIN AND PRICE.

We do not intend to retaliate, in either the same language or spirit, upon Messrs. Martin and Price for their attack on the editor of "The Electrical Age." It is not our desire to fill the pages of this journal, devoted to the advancement of electrical interests, to retorts uninteresting to our readers, but it is our object to clearly define our position and allow the unbiased judgment of our friends to act freely. The article published in "The Electrical World and Engineer," expressing an opinion of our editor, Newton Harrison, is so hostile in its tone that possibly the readers of it might believe that extenuating circumstances forced Mr. Martin to pursue this course. The source from which Mr. Martin obtained his information was a San Juan (Porto Rico) newspaper called "The San Juan News." "The San Juan News" received it from the New York "Sun," and the New York "Sun" from one of its reporters. We might discuss the contents of the article in the "San Juan News" from a purely tecnical standpoint and probably occupy much space and time without materially advancing the situation. But what we desire to show is that Mr. Martin did not enquire of our editor whether the "San Juan News" was correct or not, but rushed into print. This not only showed a disregard of our editor's feelings, but a desire to criticize without proper investigation, and in this Mr. Martin knows, as well as we do, that he was wrong. We have never wilfully attacked any of our neighbors nor taken advantage of circumstances that might lead to their ridicule or humiliation, and we are glad of it to this day. It might afford temporary satisfaction to return evil for evil, but all fair-minded men kow that the sternest judge of their own acts is their own conscience, and we leave Mr. Martin to his.

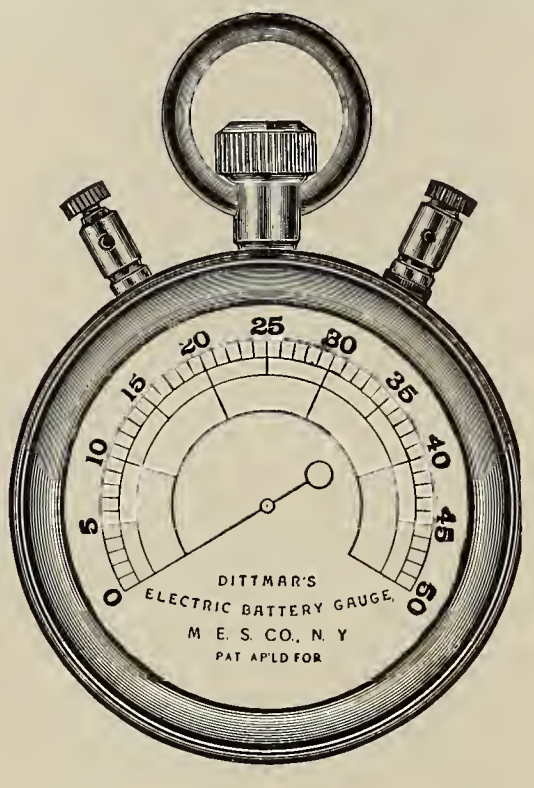
As far as Mr. Price is concerned, regarding the matter published by him in "The Electrical Review," we believe he has made a great mistake. Freedom of speech is certainly one of the admitted privileges of every citizen of the United States, but only in so far as it does not injure his fellow-men. In this respect we believe Mr. Price overstepped the limits and either said more than he ought or less than he intended. The remarks to which we refer will be found in "The Electrical Review" of September 12th, 1900. In this case, as that of Mr. Martin's, of "The Electrical World and Engineer," it was beneath the dignity of Mr. Price to endeavor to ascertain to any degree the truth of the remarks published in the "San Juan News." But, following the same policy as Mr. Martin, he preferred to condemn first and examine afterwards. But we do not object to criticism as long as it is confined entirely to the facts of the case, provided they represent the truth. But when personalities are indulged in that affect the character, reputation and standing of our editor we think it best to adopt another course. We placed the matter in the hands of our attorneys, believing that as the law was the test of right its exponents would quickly decide for us the nature of the attack made. Their opinion that the remarks made by "The Electrical Review" were highly injudicious simply strengthens the conclusions we first arrived at in reading the article. On their advice we have commenced action in the Supreme Court for libel against "The Electrical Review." We hope that the serious aspect this case has taken will lead "The Electrical Review" to exercise more caution in expressing its opinion in the future and in exercising the prerogative of free speech.

M. WILLOT'S SYSTEM OF SUBTERRANEAN WIRELESS TELEGRAPHY.

M. Willot, chief inspector of the French telegraphic system, has advanced a new theory in relation to the Marconi system of wireless telegraphy, embodied in a paper to be read before the Congress of Electricians, at Paris. His idea is that the earth conveys the impulses projected into space by the apparatus used in wireless telegraphy. From a scientific point of view his theory will bear some inspection. According to a special cable received by the New York Sun "His theory involves communicating through the geological beds in which the earth's electricity has the same tension, the idea being that any disturbance at one point on the same electrical level creates what would naturally be called a swell in the whole level, leaving the higher and lower strata comparatively undisturbed. M. Willot proposes to tap these levels, boring shafts and measuring the electrical tension with the electroscope. The French telegraph department has appointed a committee to sink shafts to ascertain the distribution of the electric levels. When this is done M. Willot undertakes to construct an apparatus that will meet every case."

Craig, N. Y.—Articles of incorporation of the Niskayuna Power Company have been filed with the Secretary of State at Albany. The company is capitalized at $100,000, all subscribed. Its purpose is to dam the Mohawk River just below the State dam at Craig for power purposes. The incorporators, who are also the directors of the company, are E. C. Brown (builder of the Mechanicville dam), W. H. Fritchman, M. Montgomery and Mr. Landis, of New York, and W. A. Graves, of Rexford Flats.

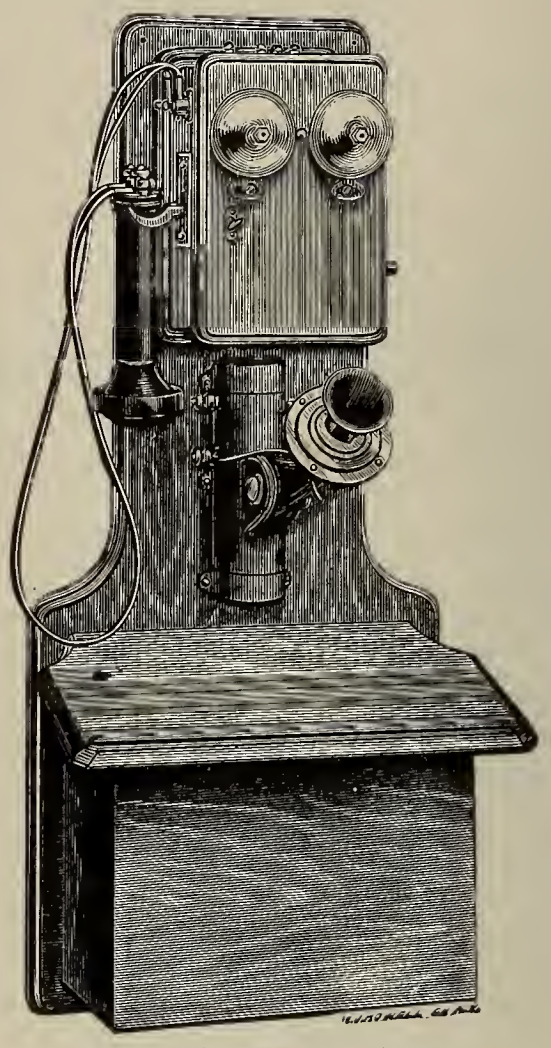
turbance. The receiver and magneto perform their functions uninterruptedly. This telephone is highly recommended for exchanges or private lines. Being manufactured by this concern in large quanities the prices quoted in every case are satisfactory. Two Mesco cells are supplied with each outfit. The variety and heterogeneous character of the supplies handled by this company occupy the contents of a very bulky catalogue.



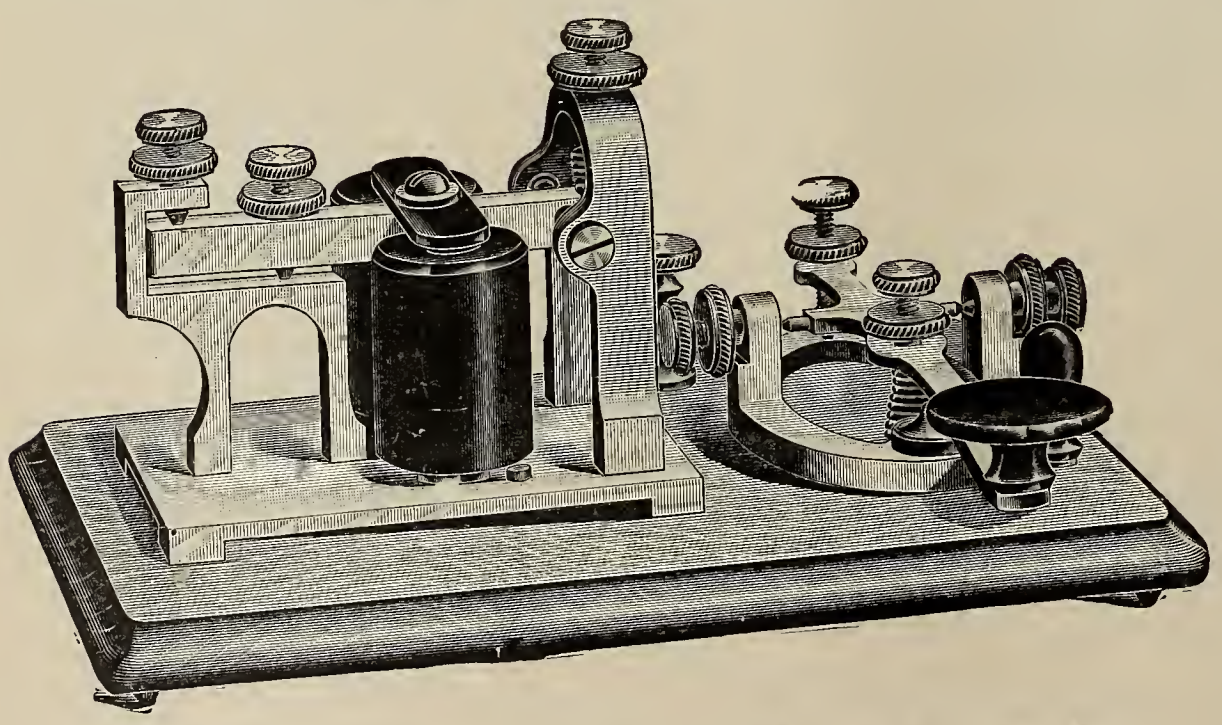
Every years this list is increasing and it represents in many respects a compendium of electrical engineering full of interesting reading matter and illustrations as well as descriptions and prices. Copies will be sent on receipt of application and goods delivered on mail orders.

AUTUMN IN THE ADIRONDACKS.

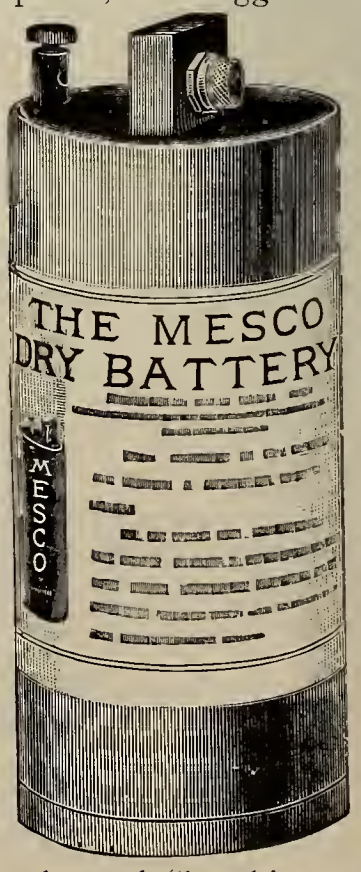
September and October are the pleasantest months of the year to spend in the Adirondacks, and even the forepart of November is generally found an agreeable time to be in the woods. To be sure, the residents of the cities have not the same incentive at this season to visit the mountains as in the hot days of July and August, but to be in the forest when the air is clearest—air that you can breathe with the same pleasure that you would have in drinking cool spring water on a warm day—and when the handiwork of "Jack Fronst" begins to make itself apparent in the changing of the foliage from its summer green, by first tinging and gradually turning it into the beautiful colors that delight the eye and soul of the artist, that is the time to go to the Adirondack Mountains. And, speaking of artists, it is in this great forest and mountain region that artists have at their disposal material of a variety and value not to be found elsewhere. The lakes and ponds, the sluggish winding streams, the bounding brooks and "laughing waters," the rugged mountains and passes, the forest covered hills and valleys—a combination of attractive scenery at our very door, in no way inferior to that of Europe which artists are wont to travel thousands of miles to view and transfer to canvas.



Long Distance Telephone.



Improved Giant Sounder (with Aluminum or Brass Lever) and Steel Lever Key Combination Set.



Not only to the artist is the region attractive in the fall, but the belated vacation may be spent in the Adirondacks with profit in a physical sense. For the tired-out brain worker no better place exists for recuperation and building up the broken down system. Tramping in the woods and boating on the lakes and streams will do what gallons of medicine can not for American nervousness and kindred complaints.

In mid-September the Adirondack hotels begin to lose their crowds and special rates are offered for the balance of the season. October first finds the large hotels about ready to close, but many of the smaller houses and camps remain open through October and November. None wishing to avail themselves of the excursions offered in this leaflet need fear failure to secure hotel accommodations. The New York Central's "Four-Track Series" No. 20, "The Adirondack Mountains and How to Reach Them," contains a list of the hotels, camps and boarding houses in the Adirondack region, with the location and post office address of each.

Incandescent Lamps.

BY FRANCIS W. WILLCOX.

(Continued from page 87-)

BETTER UNDERSTANDING OF LAMPS, ETC.

In early days the consideration for a lamp was simply that it should burn—the longer the better (so it was considered), irrespective of how much loss of light the lamp had suffered. No questions were asked as to the correctness or variation of candle-power or the limits of power consumed—in fact, the irregular voltage and absence of meters rendered it comparatively unimportant.

The first subject on which customers sought information was the power consumed by the lamp. A great amount of attention was directed to this feature, on account of the fact that dynamos were rated and sold by the number of lamps they could serve, and therefore a high economy lamp helped to increase the capacity of every dynamo. With the introduction of the 3-watt lamp the question of mere initial efficiency became paramount. The real important feature, the amount of light given by a lamp, was, however, ignored or considered only in connection with its initial rating.

The manager of one of the large Edison stations actually stated, several years since, that he refused to believe his lamps ever changed in candle-power.

It is singular, when we consider it, how long it has taken lighting companies to understand the real essentials of a lamp. For years lamps were used as mere power-consuming devices—the light they gave was a secondary consideration. Some attention was called to the fact that lamps lost in candle-power while in service, but little heed was paid thereto. Many thought it a ruse on the manufacturer's part to dispose of more lamps, or if any considered the subject at all seriously, they concluded it was a slight matter at most and decided to leave bad enough alone.

It has taken years to bring home the real considerations to electric lighting companies. These considerations are that a lamp is primarily designed and used to give light—that lighting companies are in the business of making and selling light, not power—and that the lamp is the chief essential of the lighting system.

Perhaps much of the blame for this lack of understanding can be laid to gas practice. Electric lighting has very naturally followed the principles and practice of the gas business. Gas fixtures and burners were supplied by the consumer, hence in electric lighting lamps should likewise be supplied, i. e., purchased and renewed by the consumer. Gas tips were replaced only when broken, hence electric lamps should be used until they were burned out. The error of thus parallelling gas practice becomes evident when the difference in the conditions affecting each business is considered. In the gas business the quality and character of the light is dependent upon the quality of the gas—the old burner or tip (so long as it was not fouled) did not affect the result, and as these tips suffered little or no deterioration, there was no need of ever replacing them. Mark the difference in the case of the electric light. Here the quality of the light (with voltage uniform) is not dependent upon the current—but upon the burner, i. e., the lamp. Lamps upon the same circuit can be found that give markedly different results in light; moreover, the same lamp under same voltage will, when old, give but a fraction of the light it gave when new. These are well-attested facts, which clearly show that much in electric lighting depends upon the burner and in gas practically nothing. Hence, what might be good practice for gas is entirely wrong for electric lighting.

(To be continued.)

*Read before the Franklin Institute.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.

PATENTS ISSUED SEPTEMBER 4, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

657,090. Pneumatic-despatch tube apparatus. J. T. Cowley, Lowell, Mass.

657,104. Method of stringing or supporting electrical

657,159. Rheostat controller. J. Dillon, Milwaukee, Wis.

conductors. L. Hackethal, Hanover, Germany.

657,165. Sewing machine motor attachment. E. P. Huyck, Swanton, Ohio.

657,170. Automatic railway-signal system. J. W. Lattig, West Bethlehem, Pa.

657,195. Automatic safety cut-off for elevators. G. G. Guenther, Orange, Cal.

657,196. Submarine cable. Theo. Guilleaume, Mulheim, Germany.

657,199. Electric lamp for dental purposes. B. E. Lawton, Providence, R. I.

657,202. Electric furnace. H. C. McBrair, Middletown, N. Y.

657,211. Electric lock. H. G. Carleton, New York, N. Y.

657,221. Static relay. I. Kitsee, Philadelphia, Pa.

657,222. Wireless or space telegraphy. I. Kitsee. Philadelphia, Pa.

657,223. Receiving device for telegraphy. I. Kitsee, Philadelphia, Pa.

657,224. Wireless or space telegraphy. I. Kitsee, Philadelphia, Pa.

657,288. Telephone transmitter arm. G. R. Kennedy, Allegheny, Pa.

657,305. Means for relieving telephone lines from deleterious electrical charges. C. H. Arnold, Boston, Mass.

657,311. Closed conduit electric railway. L. Dion, Boston, Mass.

657,315. Telephone switching apparatus. D. S. Hulfish, Chicago, Ill.

657,316. Telephone trunk line. D. S. Hulfish, Chicago, Ill.

657,330. Electric railway. T. P. Chandler, Philadelphia, Pa.

657,338. Central battery telephone system. W. W. Dean, Chicago, Ill.

657,339. Plug and socket for telephone system. W. W. Dean, Chicago, Ill.

657,359. Thermostat. H. E. Reeve, New York, N. Y.

657,378. Roentgen ray apparatus. W. S. Andrews, Schenectady, N. Y.

657,413. Hanger for battery elements. J. L. Hayes, Salida, Colo.

657,414. Fuse. R. Hundhausen, Wilmersdorf, Germany.

657,416. Speed controller for electric elevators. J. D. Ihlder, Yonkers, N. Y.

657,432, 657,433. Electric arc lamp. J. Melzer, Cleveland, Ohio.

657,450. Electric arc lamp. I. R. Prentiss, Lynn Mass.

657,477. Piano action or other keyboard instrument. T. Cahill, New York, N. Y.

657,478, 657,479. Typewriting machine. T. Cahill, Washington, D. C.

657,484. Closed conduit electric railway. L. Dion, Boston, Mass.

657,485. Electric arc lamp. T. E. Drohan, Chicago, Ill.

657,487. Electric railway system. E. Frischmuth, Berlin, Germany.

657,502. Support for electric lamps. W. A. Swan, Providence, R. I.

Business News.

NEW INCORPORATIONS.

New York City.—Cook Electric Company, of New York city. Capital, $10,000; directors: S. S. Cook and Martha A. Cook, of Long Island City, and David Mason, of New York city.

Danville, Ill.—The Westville Eelectric Light and Power Company, of Danville, has been incorporated. Capital stock, $20,000; incorporators: Michel Kelly, M. W. Kelly and Edward J. Kelly.

Laconia, N. J.—The Laconia Manufacturing Company has been incorporated to do a general electric business. Capital, $500,000; incorporators: G. B. Morton, W. H. Carey, C. Sickelman; G. B. Morton, attorney; all of Jersey City.

Clinton, Ill.—The Citizens' Electric Company, of Clinton, has been incorporated, capital $15,000, to operate electric light, heat and power plants; incorporators: E. S. Nixon, Titus Hinchliffe and W. W. Newman.

Leadville, Colo.—The Leadville Gas and Electric Company, of Leadville, Lake County, has been incorporated with a capital of $200,000; John F. Campion, Robert B. Sullivan, Gilbert Wilkes and C. K. Boettcher are the incorporators.

Louisville, Ky.—Articles of incorporation have been filed by the Central Electric Company, with a capital stock of $10,000; the incorporators are: J. S. Carill, P. M. Gelatt and W. C. Hines. The company will manufacure electric supplies.

Hamilton, Tenn.—The Secretary of State has granted a charter to the Reed Automatic Trolley Head Company, of Hamilton County, with $1,000 capital stock. The incorporators are: E. M. Smith, E. S. Reed, W. P. McClatchy, Harry Preston and W. C. Shelton.

Portland, Me.—The Vermilion Railway and Light Company, of Portland, Me., has been incorporated to do a general railway and electric light business. Capital, $1,000,000; incorporators: G. Burnham, Jr., G. F. Duncan, E. Woodman, N. Clifford, P. G. Broun, all of Portland, Me. Flournoy, Price & Smith, attorneys, Charleston.

TELEPHONE CALLS.

Staunton, Ill.—The Staunton Telephone Company has been organized. Capital stock, $2,500; incorporators: C. R. Wall, S. P. Williamson and C. Godfrey.

Charleston, W. Va.—The American Duplex Telephone and Telegraph Company, of Charleston, has been incorporated to do a general telegraph and telephone business. Capital, $1,000,000; incorporators: J. E. Scraggs, E. L. Wood, C. R. Burdette, A. H. Wilson, Jr., J. E. Chilton, all of Charleston; Chilton, MacCorcke & Chilton, attorneys, Charleston.

Warsaw, Ind.—With a capital stock of $30,000 a new organization, known as the Commercial Telephone Company, of Warsaw, has filed articles of incorporation, having purchased from the Warsaw Telephone Company its local system and all its toll lines which connect 48 points in northern Indiana, Warsaw being the central station. The incorporators are Strauss Brothers, Ligonier, Ind.; John J. Wideman, Odell; C. W. Burke, Silas W. Chipman, Charles E. Wahl and Mel. R. Williams, of Warsaw.

STREET RAILWAY NEWS.

Denison, Tex.—The charter of the Denison & Sherman Railway Company has been approved by the attorney general. Capital stock, $100,000. The purpose of this corporation is to build an electric line eight miles long between the two cities named and extending five miles within the limits of both. Incorporators: A. G. Moseley, Tom Randolph, E. J. Smith, J. W. Blake and others.

AUTOMOBILES.

Newark, N. J.—The Standard Auto-Vehicle Company has filed articles of incorporation. The authorized capital is $250,000. The company will manufacture vehicles and motors.

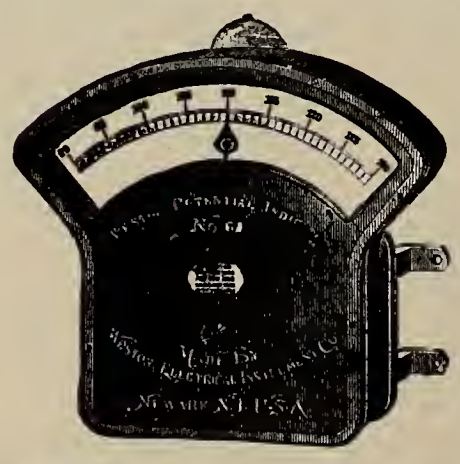
BUSINESS CHANGES.

San Antonio, Tex.—The Dubinski Electric Company filed a deed of assignment August 30.

Cambridgeport, Mass.—The Simplex Electric Company, of Boston, has filed a certificate with the Secretary of the Commonwealth, announcing an increase in its capital stock from $250,000 to $350,000. The increase was used to purchase new buildings and additional real estate.

New York City.—It is announced that the reorganization of the Electric Pneumatic Company is progressing favorably, and it is expected that within a few days the property will be turned over to a new company. The plan of reorganization permits the holders of 100 shares of stock to receive 100 shares of stock in the new company. For the assessment of 20 cents per share holders will be given 25 per cent. in a bond which shall bear interest at the rate of five per cent. per annum. The interest on these debenture bonds must be paid before any dividends are paid on the stock.

WESTON STANDARD ILLUMINATED DIAL STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

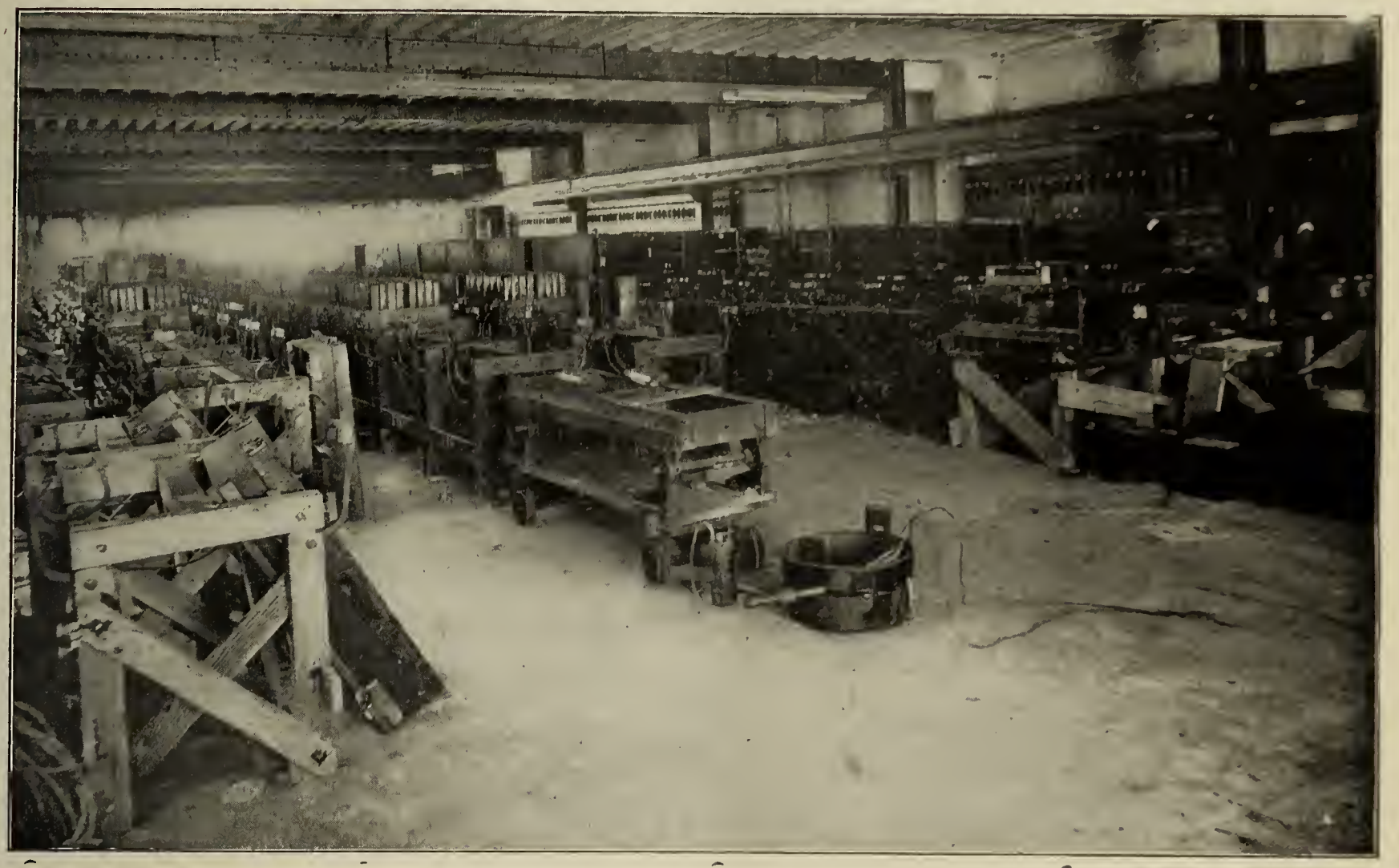
114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 13. NEW YORK, SEPTEMBER 29, 1900. Whole No. 693.

The Storage Battery.



Storage Battery Charging and Testing Station.

THE STORAGE BATTERY VS THE UNDERGROUND TROLLEY.

The recent installation of a crosstown storage battery car line in Thirty-fourth street, New York city, in place of the underground trolley, which would represent a continuation of a now prevailing system in New York, is highly illustrative of the effect circumstances have upon the choice of a system. In this case, which is unique because of the repeated failures in the past of storage battery car lines, the only successful solution of a problem was to be found in the application of the storage battery for the propulsion of these cars. Why storage batteries were used at all in preference to the underground trolley is interesting, in a technical sense, to even the lay reader.

It has been ascertained by experience that a crosstown line, intersecting many underground trolley systems, would represent an expensive proposition, if at each point of intersection the system was made continuous, as at the juncition of Fifty-ninth street and Third avenue and Second avenue. As far as first cost is concerned it would be a conservative estimate to place the expense of a mile of crosstown road of underground trolley, intersecting in the manner described with other roads, at five times the cost of a straight mile. The original outlay is therefor all out of proportion to the returns, which in this case, on the transfer system, are comparatively small. The straight roadbed, devoid of conduit, built strongly enough to enable the heavy storage battery car to pass over it freely, without the possibility of rapid deterioration of the tracks taking place, is at first sight a more cheerful proposition from a financial standpoint. The comparatively high efficiency of the modern storage battery and relatively low rate of deterioration certainly adds to the presumption that a storage battery line would be exceedingly cheap, in comparison with an expensive conduit installation. The compressed air cars, used on the Twenty-eighth and Twenty-ninth street crosstown roads, will be relegated to the scrap heap and storage batteries likewise installed.

The adaptability of the storage battery in this case is due to the admission of three things: First, thorough knowledge of what may at the most be expected from it; second, a grasp of the circumstances through which it becomes cheaper to utilize, and finally, though not least important, a stronger and better storage battery. The vast spread of automobile service and the impetus given to its manufacture throughout the country is, as far as electric vehicles are concerned, entirely due to the solid improvement in the stroage battery. Too much is not expected of it and extraordinary lightness is not aimed at as much as durability and moderate efficiency. The advantages of his last new system of traction finds its ideal application on Fifth avenue, where the automobile stage coach service, so prevalent in Paris, is well duplicated.

The Incandescent Lamp.

By Francis W. Willcox.

(Continued from page 95.)

Recognition of these principles has caused the leading electric light companies to make the lamp a part of the apparatus owned and installed by the station. They have taken lamps out of the hands of the customers and supply all that are used on a free renewal basis. This prevents the customer from depreciating results and balking the efforts of the central station management to give a good service, as poor lighting is an inevitable result where the customer buys and renews his lamps.

This is one reason why electric lighting in the United States is so much in advance of the service abroad. In continental Europe the lamps are peddled out to customers of lighting companies by hardware stores, chandler shops and such. This not only renders a poor lighting service, but retards improvement in the art of lamp making. Under such conditions of supply and use of lamps, the lamp that is the cheapest and that will last longest is prized. This is almost invariably the lowest grade of lamp, and there exists, therefore, no incentive to the manufacturer to advance in his art. Relegating lamps to the hands of the customer always puts a ban upon quality. The control and supply of lamps by the lighting station on the contrary puts a premium upon quality. It is this excellent, wise and far-seeing policy on the part of the leading companies of the United States which has advanced their electric service and development beyond all other countries, and has aided the American manufacturer to produce an incandescent lamp that surpasses any in the world.

Nevertheless, knowledge of lamp essentials and correct use is not as widespread as it should be in the United States. There are hundreds of lighting companies in all parts of the country who are ignorant of or indifferent to a proper understanding of the subject. They will properly attend to the repair of boilers, engines or dynamos and all apparatus but that of the lamps, forgetting that the deterioration of the latter affects their service more noticeably and directly than any other cause. Enormous as is the consumption of lamps to-day, it is not half as large as it should be or would be were the proper and economical use of lamps observed by all lighting plants.

At the present low price of lamps, the cost of 600 hours to 1,000 hours of service is from eight to ten times the value of the lamp, and renders it economical, therefore, to the highest degree to use the highest efficiency possible and replace lamps frequently, since it is evident that the value of the current consumed by the lamp soon eats up the value of several lamps.

Byron says:

"Better five hundred hours of glorious life
Than a thousand dimly lit . . ."

and this is the ethics of lamp economy and service to-day.

Numbers of papers and discussions have treated on the subject of the lamp efficiency most economical for a given set of conditions and of the most economical life of lamps. All such discussions have their value, but the difficulty of applying formulae to the varied and constantly changing conditions of different stations has limited their adoption in practice.

The present method is to follow a few simple rules formulated from the limiting conditions of practice.

The general rule as to efficiency of lamps is to use the highest practical efficiency suitable to the regulation. This gives the maximum station capacity in number of lamps and minimum cost of light to public.

As regards life, the leading practice is to limit the service of lamps to what is called their useful life. The 20 per cent. of its candle-power—for example, the time useful life is the period of time a lamp burns until it loses required by a 16 candle-power lamp to drop to 12 8-10 candle-power.

This period is known for any given economy or make of lamp averaging to-day above 400 hours for the best 3.1-watt 100-125-volt lamps. The practical service method then is to renew lamps frequently enough to keep the average life within this limiting number of hours.

By periodical renewals of lamps on this basis the lighting service is kept as clean and bright as a room that is regularly swept and cleaned.

Advance in Methods of Lamp Testing.

A correct understanding of lamps is obtainable chiefly through correct methods of test, and it is therefore of highest importance that the principles of correct testing should be thoroughly known and carefully observed. This is rendered still more important when we consider the numerous chances for error possible in the testing of lamps. There is hardly any practical testing work where persons with the best intentions but not thoroughly conversant with the subject are as apt to obtain discordant or misleading results.

It is gratifying to observe the growth of understanding on this subject, especially in the last two or three years.

Not more than eight years ago a paper was read before the Institute of Electrical Engineers giving an account of a lamp test as then conducted. It throws an interesting light on the lack of understanding thereon. In this test lamps of varied efficiencies running from 3½ to 4½ watts per candle were compared with one another in a life test without any allowance being made for this variation of efficiency. Further, results were considered chiefly as affecting the life of the lamps, and, although candle-power readings were taken, they were not reduced to percentages or any proper comparative basis.

This was on a footing with testing a lot of ropes of varying diameters by loading them all with the same weight and choosing those ropes as best that failed to break, irrespective of size of their diameter. In another instance a prominent professor of electrical engineering attempted to prove the value of so-called improvement in exhaustion by comparing 32 candle-power, 50-volt lamps thus exhausted with 16 candle-power, 100-volt lamps made in regular way. As a 32 candle-power lamp is naturally better than 16 candle-power, and likewise 50 volts better than 100, the error of this course becomes evident at once.

I desire to conclude this paper by a discussion of some of the features of lamp-testing, the latest methods of test, methods of determining and comparing the values of lamps and say a few words in regard to specifications and guarantees.

A lamp test can be said to be conclusive only when (1) the average product of each manufacturer is taken, and not specially selected lamps; (2) when a sufficient number of lamps are tested to secure a correct average result; (3) when the principles of correct testing are carefully observed, and (4) when the test is continued long enough to bring out the qualities of a lamp.

Modern methods of test cover three general features:

The physical examination for vacuum, defects in filament, and mechanical parts of the lamp.

The initial test for correctness of rating in candle-power and wattage at the rated voltage.

The life and candle-power performance test.

It is strange that the first two of these features of test were never formerly used. They are as necessary as the physical examination of the soldier to determine fitness for duty.

*Read before the Franklin Institute.

A lamp that cannot pass muster under physical requirements should never be accepted.

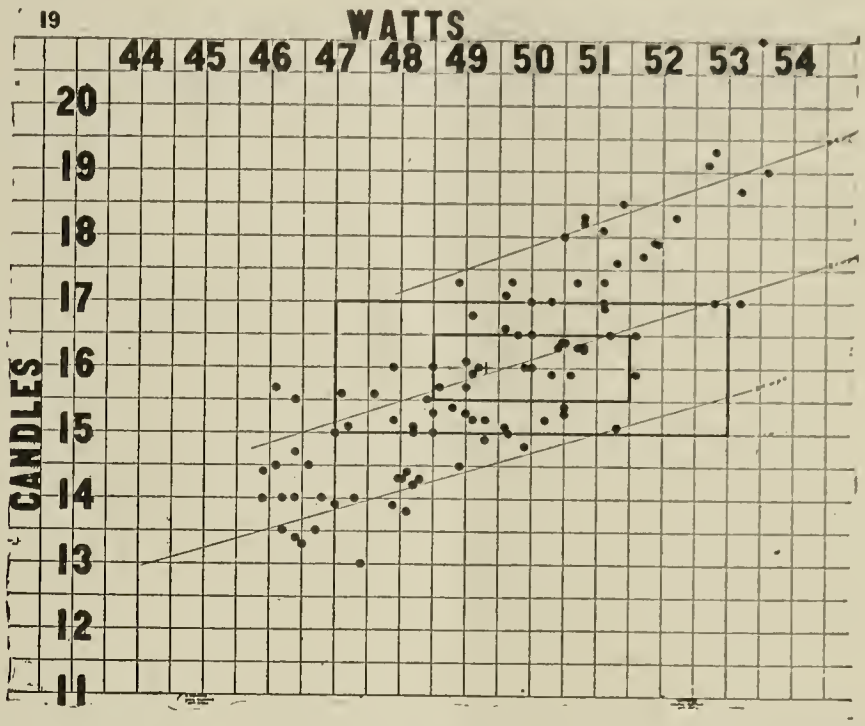


Fig. 2.—Target diagram showing initial measurements at marked voltage of 100 lamps, rated at 16 candle-power, 50-watt lamps.

The effects of poor vacuum or of defective filaments are vital and far-reaching. Their elimination, therefore, becomes of the highest importance.

power rapidly and within a few hours—a most objectionable type. The test for vacuum is made with an induction coil drawing about a 3-8-inch spark. By touching the base of the lamp to one of the secondary terminals of this coil a glow or fluorescence is caused inside the lamp. A well-exhausted lamp will either show no glow at all, or a slight flash or fluorescence.

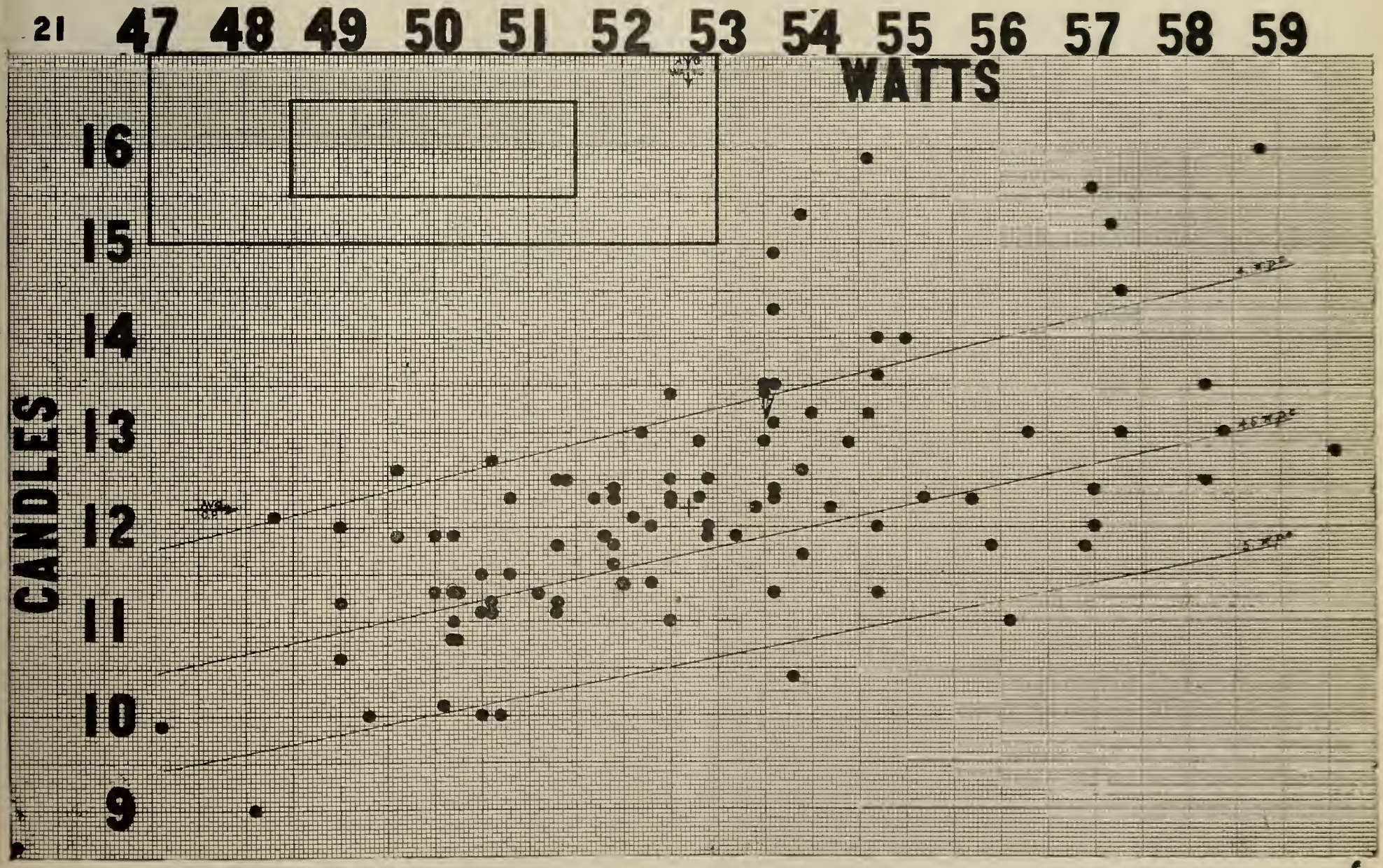


Fig. 3.—Target diagram showing initial measurements at marked voltage of 100 lamps rated as 16 candle-power, 50-watt lamps, illustrating very inaccurate rating.

Poor vacuum results in the production of what are known as slumpers, i. e., lamps that decline in candle-

Filaments are subject to a defect known as spots. This is a thin spot or a point of high resistance in the filament. By burning the lamp dull red these spots are seen very distinctly. This spot is a weakness in the carbon and will cause it to burn out. Spots, therefore, are very serious faults, as they cause early breakage and shorten the life of lamps. Tests for this defect can readily be made by burning the lamps two in series. The spots will show up as bright points against the dull red of the filament.

Another serious fault in filaments is discolored carbons. A good treated carbon has a uniformly bright, shiny steel gray surface over its entire length. A discolored carbon shows up a sooty black or brownish oily-looking surface, either partly or wholly covering the filament. Such discoloration causes a rapid loss of candle-power, a most undesirable result. They can be detected by an eye examination of the filament by light (filament not burning).

In some makes of lamps tested the percentage of physical faults has been found to be over 100 per cent. Numbers of barrels of different makes tested showed an average of fifty lamps to the barrel with discolored carbons. In another make thirty-two lamps with bad vacuum were found in one barrel.

The value of a physical inspection is unquestionable. It is also a ready means for the early detection of the incompetent or careless manufacturer and the rejection of poor lamps, thus saving time and trouble of any further test.

It should be an invariable rule in the purchase of lamps to reject any lot, samples from which are shown on test to contain 10 per cent. of any of these defects.

CORRECT INITIAL RATING OF CANDLE-POWER AND WATTAGE.

The value of close and uniform rating has only been appreciated in recent years. Of course it was not desired to have lamps very low in candle-power, but no objection was made as long as the variation was not more than the eye could detect (about 3 or 4 candle-power). For lamps to run high in candle-power was by many considered as very desirable, and one manufacturer used to urge it as an advantage with his lamps that his 16 candle-power lamps gave more light than any other, and there was no doubt about it; some of his 16 candle-power lamps ran as high as 30 candle-power.

For many years lamps were selected for watts, but the candle-power was allowed to wander over a considerable range. As the only testing instrument generally available was a wattmeter, skimping in candle-power passed unnoticed. This resulted in selling lamps for one efficiency which were really of a much lower efficiency, and there was no end of false conclusions.

With the introduction of the photometer, especially the portable photometer, most of this trouble ceased.

The importance of a close and uniform rating is very great. We can consider the value of it in a more interesting way by an examination of some results of initial tests.

A very clever way has been devised of diagraming the results of initial test. (See Figs. 2, 3 and 4.) This is called the target diagram method. By plotting the candle-power as ordinates and the watts as abscissæ, we have a graphic means of delineating accurate marksmanship (or the absence of it) in lamp manufacture. The center of diagram, or bull's eye, is made the intersection of the 16 candle-power line, and the 50-watt line (in case of 16 candle-power 3.1-watt lamps). The readings taken upon each lamp of a lot tested are plotted by placing a dot at the intersection of the corresponding candle-power and watts line, and in this way the entire number tested are plotted. The rectangle drawn shows the limiting specifications for good lamps. The diagonal lines shown give the watts per candle.

(To be continued.)

The Telephone.

SIR WILLIAM PREECE'S SYSTEM OF WIRELESS TELEPHONY.

A cable dispatch to the New York Journal states that the sensation of the British Association's session at Bradford has been Sir William Preece's reported discovery of wireless telephony. Preece has been experimenting on the possibility of wireless telephony since 1894, when he made trials to determine the laws governing the transmission of Morse signals by his electromagnetic method of wireless telegraphy to compare telephony with telegraphic signals—that is, to ascertain whether articulate speech could be maintained under the same conditions as the Morse signaling.

The first trials across Loch Ness, Scotland, in 1894, showed it was possible to exchange speech across the Loch at an average distance of one and a half miles, using parallel wires along four miles on each side of the water.

"Principal Lodge having introduced an admirable call system in '99," he said, "I conducted some experiments across Mehai Straits, which determined the fact that maximum effects are produced when parallel wires terminated with plates in the sea itself.

"It became quite evident that the ordinary inductive effects were much enhanced by conducted effects through water, and that in consequence shorter wires are practical.

"No special apparatus seems necessary. Ordinary telephone transmitters and receivers were used.

"It being desirable to establish communication between the islands known as the Skerries and the mainland at Anglesey it was determined to do this by means of wireless telephony. A wire 750 yards in length was erected along the Skerries, and on the mainland one of three and a half miles, each terminated by an earthplate in the sea. The average distance between the paralleled portions of these wires was 2.8 miles.

"Telephone communication is readily maintained and service is good. Further experiments in wireless telephony recently made between Rathlin Island, in North Coast Island, and the mainland, a distance of four miles, presented the question for solution whether a line running the whole length of the island was necessary to obtain good communication.

"Experiments prove conclusively that communication, both telegraphic and telephonic, can readily be maintained. These experiments show that wireless telephony across the sea is now practical by the commercial system.

"No experiments have been made with ships, but is would appear simple to speak by telephone between ship and ship or ship and shore over considerable distances by means of a circuit formed of copper wire terminating at each end of the ship in the sea, passing over the topmast and using simple telephones."

LITERARY NOTE.

It is pleasant to see the very prompt appreciations of noteworthy American books which nowadays appear in English reviews. The London Daily Chroncicle, for instance, in a long review of Francis Hovey Stoddard's work on "The Evolution of the English Novel" says "it is particularly pleasant to welcome from the academic headquarters of New York a volume of criticism which is not only well written and well-informed, but also marked throughout by measured judgment, proportion, and a certain dignity of attitude and expression. . . . A careful study of the art of fiction, such as that of Mr. Stoddard's, should be part of the equipment of every would-be romancer."

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., }
OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.

JOSEPH MUIR, M. D., }
FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

NEW YORK, SEPTEMBER 29, 1900.

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LAMPS AND THEIR FUNCTION IN MUNICIPAL LIGHTING.

While the interests of the lamp manufacturers, combined with those of the electric light stations, represent in the aggregate a sum that compares favorably with the investment made in street railway installations, yet with respect to the peculiar functions lamps using electricity are adapted to, little has been said of a noteworthy and practical character. It is surprising to observe the gross ignorance exhibited by the proprietors of large stores when the choice of the character of the illumination to be employed rests solely with them. There are so many opportunities presented in a case of this kind for the installation of electric lights of all of the varieties known to man that possibly it may not be considered strange that the proprietor's choice betrays an absolute lack of practical knowledge in this respect. The lamps giving illumination through the medium of electricity have greatly changed in their character in the last few years. The arc lamp, weighing in earlier days more than fifty pounds, has been reduced and refined through improvements in its mechanism and construction to such an extent that it weighs less than ten and frequently less than five pounds. In addition its size has been reduced that its function has changed likewise. For home illumination the arc lamp was prohibitive, positively tabooed. Arc lamps may be found on the market to-day of a size so dimunitive that they consume no more current than that required for less than half a dozen sixteen candle power, one hundred and ten volt lamps. The very construction of the lamp makes it as practical for home illumination as the incandescent lamp and the increased candle power for the same consumption of energy is regarded by many as distinctly advantageous.

The incandescent lamp has passed through the same stages of evolution. But its more general use makes up for the increased competition it meets with from the Welsbach burner, the acetylene light and the improved and miniature forms of the arc lamp. The function of incandescent lamps as a source of illumination, with respect to large stores or public institutions, is confined, in the first place, to their utilization in great groups or clusters for widespread lighting. Whereas it is generally admitted that the incandescent lamp performs its function admirably in the store window the question arising in the contractor's mind is whether he can conscientiously install a large cluster of incandescent lamps at a given point in place of an arc lamp. In this respect either one or the other are displaced at times merely for the sake of an advantage in the initial cost of an installation or increased light for the same consumption of power. In a large city, where the question of municipal lighting becomes an important one, not only in the streets but in various large public buildings, the calculations of contractors, unless guided by rigid specifications, are apt to differ widely and the lowest bid is not always an indication that the greatest satisfaction will be accorded to the city when the contract is concluded. It might be advisable therefore, and this is merely a suggestion, for someone to make a careful study of some of these problems, as indicated above, for the purpose of tabulating the results which would show relatively the advantages and disadvantages, the cost and efficiency of the various kind of lighting performed in special cases by means of the arc or incandescent lamp. It would also serve as a guide to the perplexed in such emergencies as may arise in a contractor's life and prove a source of great assistance.

THE NERNST LAMP IN PRACTISE.

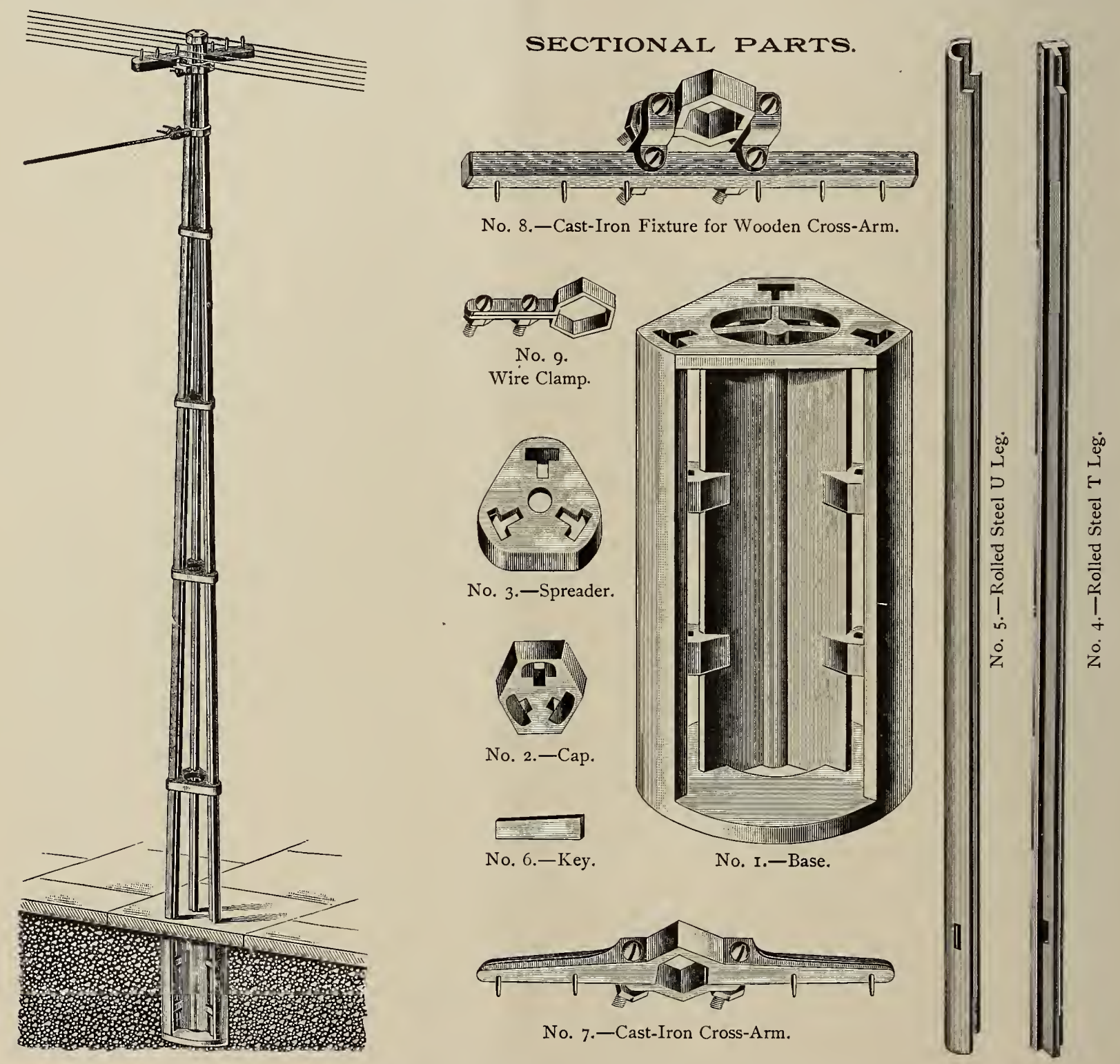
In reviewing the situations presented by the varied fields of occupation of an industrial character, particularly with reference to the manufacture of machinery, it would seem that the striving after perfection might be synonomously expressed as a striving after efficiency. Nor has this intention on the part of manufacturers been confined entirely to that class who produce our engines and boilers and dynamos and motors. It is found developed along lines of the most scientific and technical character, in the incandescent lamp factory. The Nernst lamp, whose history in the field of electric lighting has just begun, is a rara avis in its way, possessing an efficiency which lifts it far above the plane of the incandescent lamp and possessing none of the natural failings of the arc lamp it represents a hybrid type, extremely welcome and, as far as reports are concerned, equally practical. We have seen rare oxide filaments tested for efficiency and candle power with a result that showed but 1.2 watts per candle power. We have read reports of rare oxide lamps of the most enthusiastic character, but in the Nernst lamp we find a type that stands, as it were, isolated from the rest, enjoying the highest efficiency to be expected from the incandescnt type, requiring no renewal of the element through which illumination is produced and dispensing entirely with the necessity of surrounding it with either a vacuum or a gas that preys upon its integrity. The possibilities therefore in a practical sense are apt to be very great and unless we find it possessed of some salient defect at present of an unimaginable character it seems destined to play an important part in the development of electric lighting interests in the United States.

Construction Specialties.

THE ELECTRIC TRIPARTITE STEEL POLE.

The Electric Tripartite Steel Pole Company, No. 253 Broadway, New York city, rooms 418 and 419, are the sole manufactureres of tripartite steel poles, the strongest and simplest poles in the market. The tripartite steel poles are made from high grade rolled steel. The T's or U's are formed in tripod shape, set in cast iron base, keyed and rivited, with collars and spreaders, making a positively rigid pole. These poles have been tested at Stevens Institute, Hoboken, N. J., with the result that in every instance when the load was released the pole came back to its original position, showing that it is the only pole made that will not take a "set" through the weight of snow ice or heavy winds, having stood a strain of a ton weight suspended on a steel rope fastened to two of these poles set 100 feet apart. The rope broke under the strain, leaving the poles in the exact position of their original setting. The tripartite steel pole is superior to all other supporting devices in strength, elasticity and simplicity and is admirably adapted for electric light and power lines, trolley lines, telegraph and telephone lines or for such general purpose as circumstances may dictate.

Many large lines now under construction are to be supported by these poles in connection with transmission of power circuits. Added improvements since the latest catalogue was issued is the furnishing of bases of any depth desired for the support of the poles and the adoption of the U shaped leg on account of its greater strength and lightness, though the company is willing to furnish any shaped leg desired. The president of the Electric Tripartite Steel Pole Company is Chas. Mackey; vice-president and superintendent, G. V. A. Conger; secretary and treasurer, M. E. Miller.



Complete and Sectional View of the Electric Tripartite Steel Pole.

Literary.

AN UNUSUAL BOOKLET.

The "Four-Track Series" has become such an important factor in the advertising of the New York Central & udson River Railroad that a forty-page catalogue is now required to properly announce this popular series of books of travel and education.

Sixteen is the number of the latest issue of this series, and it is the new "Illustrated Catalogue." It contains a brief sketch of each of the thirty numbers now comprising the "Four-Track Series;" it also contains a miniature reproduction of each of eight beautiful etchings of scenery along the line, with a brief description

of each.

Some of the more interesting of the books are: No. 1., The Luxury of Modern Railway Travel; No. 3, America's Summer Resorts; No. 4, Suburban Homes North of the Harlem River; No. 6, In the Adirondack Mountains; No. 7, Three Ways of Going to New York; No. 8, Two to Fifteen Days' Pleasure Tours; No. 9, Two Days at Niagara Falls; No. 10, The Thousand Islands; No. 15, The Pan-American Express; No. 20, The Adirondack Mountains and How to Reach Them; No. 21, Around the World in Sixty Days; No. 22, Saratoga, The Beautiful; No. 25, A Message to Garcia; No. 26, American Railroads; No. 27, Our Railroads and Our Canals; No. 29, A Model Railroad Folder.

A glance at this Catalogue will convince anyone of the usefulness of these small publications, and will create a desire to possess one or more of them.

A copy of the Illustrated Catalogue will be sent free, postpaid, to any address in the world, upon receipt of a postage stamp, by George H. Daniels, General Passenger Agent, New York Central & Hudson River Railroad Company, Grand Central Station, New York.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.
PATENTS ISSUED SEPTEMBER 11, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

657,541. Device for fixing incandescent electric lamps; L. J. P. Hollub, Paris, France.

657,574. High voltage insulator; A. Sinding-Larsen, Frederiksvaern, Norway.

657,623. Ice removing trolley for electric railways; J. J. Shirkey, Chicago, Ill.

657,638. Secondary battery plate; W. Bowker, Sr., Waltham, Mass.

657,659. Secondary battery; A. Jamieson, Elizabeth, N. J.

657,662. Controlling means for explosive engines; F. A. LaRoche,, New York.

657,672. Protective device against burglary; A. Petternel, Siebenhirten, Austria.

657,678. Secondary electric clock; G. P. Rose, Jr., Dubuque, Iowa.

657,694. Electric clock; Geo. Fichter, Lynn, Mass.

657,703. Electrical rheostat; H. W. Leonard, New York, N. Y.

657,722. Means for controlling excitation of boosters or generator fields; Jos. Appleton, Philadelphia, Pa.

657,730. Electric railway signal; G. H. Dunham, Quincy, Mass.

657,732. Coupling for electric conduits; E. S. Francis, Hartford, Ct.

657,736. Electric furnace; W. S. Horry, Sault Ste. Marie, Mich.

657,757. Electric bond for railway rails; H. P. Brown,, Montclair, N. J.

657,760. Electric igniter for explosive engines; I. H. Davis, Boston, Mass.

657,778. Safety device for elevators; N. B. Keyser, Philadelphia, Pa.

657,782. Electric elevator; J. W. Mabbs, Chicago, Ill.

657,795. Electric circuit closer for looms; H. W. Smith, Wooster, Mass.

657,804. Tip for commutator segments; A. R. Westerdahl, New York.

657,828. System of multiple rate metering; E. Oxley, Lynn, Mass.

657,829. Multirate metering; E. Oxley, Lynn, Mass.

657,830. Conductor and collector for electric railways; A. Petzenburger, Berlin, Germany.

657,853. Electric clock; H. G. Carleton, New York, N. Y.

657,854. Combined telephone signal and jack; O. R. Cline, El Dorado, Kan.

657,861. Electric measuring and indicating device; H. Darwin et al., Cambridge, England.

657,887. Electric train signal device; J. F. Scullen, Chicago, Ill.

657,892. Electrically actuated safety device for elevators; N. B. Keyser, Philadelphia, Pa.

Business News.

KELLOGG SWITCHBOARD & SUPPLY CO.

The Kellogg Switchboard & Supply Company, Green and Congress streets, Chicago, Ill., was organized in 1897 with a capital stock of $250,000 which was later on increased to $500,000. The officers of the company are as follows: Milo G. Kellogg, president; E. H. Brush, vice-president; Wallace L. DeWolf, secretary and treasurer. For ten years previous to the incorporation of the corporation its president, Mr. Milo G. Kellogg, a pioneer in the telephone field, had been quietly at work inventing telephone systems and prosecuting applications in the patent offices of the United States and Europe. As a result of Mr. Kellogg's preliminary work one of the most remarkable series of inventions in the history of telephony was produced and the exclusive right to use these inventions secured to himself or his assigns. The fruit of this early work was brought to light when, on October 26, 1897, in the issue of a single day, not fewer than one hundred and twenty-five patents were granted to Mr. Kellogg as assignor to the Kellogg Switchboard & Supply Company, of Chicago. These patents, together with some fifteen or twenty previously issued to Mr. Kellogg, form the basis upon which the output of the company has rested; a foundation the like of which few companies in the field, and certainly none in the telephone field, have been fortunate enough to possess. The first factory of the company was at Highland Park, Ill., but the increasing business forced the company to secure additional quarters in Chicago. Some of the largest telephone switchboard contracts let in this country have been secured by this company, the total present capacity of these boards aggregating over 40,000 lines while their ultimate capacity exceeds 90,000 lines. Among the members of the engineering staff of the company are Kempster B. Miller, M. E., the well known telephone expert and author; F. W. Dunbar, M. E., member of the A. I. E. E., and F. J. Dommerque, M. E., a graduate of the Mathematical Institute of Zuerich, Switzerland. The Kellogg Company have recently issued two descriptive and illustrated pamphlets, one of them pertaining to the history, methods, facilities and products of the company, and the other particularly to their product in the line of telephones. Both of them will be sent on request, postpaid, free of charge and parties interested in the independent telephone movement are particularly requested to send for same.

NEW INCORPORATIONS.

Troy, Ohio.—The Troy Electric Leasing Company, of Troy, has been chartered to buy and sell electric machinery, etc. Capital, $25,000; incorporatos: C. C. Hobart, W. H. Coles, H. L. Johnston, Adeline I. Johnston, I. Rhodes.

Shamokin, Pa.—The Shamokin & Edgewood Light Heat and Power Company, of Shamokin, has been chartered to supply light, heat and power. Capital, $30,000; incorporators: M. H. Kulp, G. G. Kulp, D. C. Kaseman, H. W. Shuman, W. J. Wiest, J. Reed, all of Shamokin.

erate and furnish electricity. Capital, $15,000; incorporators: F. H. Brundage, E. Brundage, both of Malta, Ill.; D. M. Reynolds, F. R. Brundage, J. McGovern, G. R. Harnden, W. F. Brundage, all of Sherbourne.

TELEPHONE CALLS.

Batavia, Ohia.—The Batavia Telephone Company, of Batavia, has been incorporated to construct and operate telephone lines. Capital, $5,000; incorporators: W. R. Walker, J. W. Ransom, J. C. Ward, W. H. Baum, O. P. Griffith.

Athens, Ohio.—The Athens County Telephone Company, of Athens, has been chartered to construct and operate a telephone line. Capital, $15,000; incorporators: C. L. Jones, G. W. Duffee, W. E. Moler, A. F. Holmes, E. J. Holmes.

Ironton, Ohio.—The Lawrence Telephone Company, of Ironton, has been incorporated to construct and operate telephone lines. Capital, $24,000; incorporators: W. B. Seaton, J. L. Anderson, H. Russell, T. L.Collett, F. E. Hayward.

Canton, Ohio.—The Stark County Telephone Company, of Canton, has been incorporated to construct and operate telephone lines. Capital, $100,000; incorporators: F. Herbuck, R. S. Shields, H. W. Detmering, A. Dannemiller, H. A. Cavanagh.

Mineral City, Ohio.—The Mineral City Home Telephone Company, of Mineral City, has been chartered to construct and operate a telephone line. Capital, $12,000; incorporators: G. J. Markley, T. E. Wilson, E. Vankirk, J. L. Kenedy, C. D. Juvinall.

Sanbornton, N. .—The Sanbornton Telephone Company, of Sanbornton, has been incorporated to operate a telephone line. Capital, $1,150; incorporators: J. N. Sanborn, W. B. Sanborn, W. D. Woodman, E. B. Smith, all of Laconia; O. M. Smith, of Wimesquam; W. B. Fellows, attorney, Tilton.

Greensburg, Ind.—The Greensburg Telephone Company has filed articles of incorporation with the Secretary of State. Capital stock, $30,000. The incorporators are: Alfred P. Bone, W. B. Hamilton and David A. Myers. The company is to operate in Decatur, Franklin, Rush, Shelby, Bartholomew, Jennings, Ripley and Dearborn counties.

Cross Fork, Pa.—The Cross Fork, Germania & Galeton Telephone Association, of Cross Fork, has been incorporated to construct and operate telephone lines. Capital, $3,000; incorporators: Lackawanna Lumber Company, Pennsylvania Stove Company, both of Cross Fork; H. Schwarzenbach, of Germania; A. C. Green, of Wellsville,, N. Y.; W. F. Rice, of West Branch.

STREET RAILWAY NEWS.

Whitehall, N. Y.—The Whitehall & Granville Railroad Company, of Washington County, has been incorporated to operate a street surface railroad by electricity or other power, except locomotives; capital, $750,000.

Sharon, Pa.—Penhale & Fisher, of New York, have financed a traction scheme whereby the Youngstown & Sharon Railway Company is to erect a line between Sharon, Pa., and Youngstown. W. H. Park, of Youngstown, Ohio, is president; J. C. Whitia, Pittsburgh, vice-president, and Senator B. F. Wirt, Youngstown, Ohio, secretary and treasurer.

South McAlester, Ind. Ter.—Articles of incorporation have been filed by the Union Electric Railway Company, with principal offices at South McAlester, I. T. The corporation is capitalized at $122,000, and the directors are: Albert H. Howe, of New York city; Eugene E. White, William G. Weimer, William F. Browne, J. F. Craig, South McAlester, I. T.; William Wingfield, Robert E. Wood, Shawnee, Okla.; Eugene T. White, Fort Sill, Okla. The corporation is to exist for ninety-nine years.

Nyack, N. Y.—The Rockland County Traction Company has been incorporated. Its length is thirty miles, with termini at Upper Nyack and Rockland Lake, and running through the villages of Nyack, South Nyack, Piermont and New City. The principal office is to be at Nyack, and its capital is $300,000. Its directors are: Charles W. Reeve, Franklin H. Reeve, George F. Carpenter, George M. Carpenter, Samuel A. Osborn, of Brooklyn; Ethelbert D. Harris, Henry F. Shields, of New York City; Frederick Stillwell, of Hackensack, N. J., and John W. Dalley, of Nyack.

NEW YORK NOTES.

CHAS. M. M'LAUGHLIN, of J. H. Bunnell & Co., upon receiving word of the Galveston disaster, at once sent $100 to the stricken telegraphers of that city. The above is characteristic of Mr. McLaughlin's generosity, as he has done the same on similar occasions at Charleston, Cincinnati, and other places.

EDWARD HEATON, Park Row Building, general electrical contractor, installs complete electic light and power plants for all puropses all over the United States and Canada. He is now installing an electric light and power plant in the New Jersey State Reformatory. This is to be a 1,600 16 c. p. plant, with Crocker-Wheeler motors, Ball & Wood high speed and Watts-Campbell slow speed engines. Mr. Heaton is also to furnish the electric light fixtures and will put the plant in complete working order. He will be ready to receive bids for fixtures for the above installation very soon. Grimshaw wire is being used throughout this installation.

A GROWING INDUSTRY.—Mr. C. F. Splitdorf, 17-27 Vandewater street, has made a specialty of magnetic, x ray, induction and specially wound coils for all kinds of electrical apparatus. The Splitdorf system of insulating magnet wire is one of the oldest and most practical in existence and is very popular among the old line electrical manufacturers of the United States on account of its high insulating qualities. Magnets wound according to this method will stand a higher test and show 25 per cent more ohms than those magnets wound with other makes of insulated wire. Mr. Splitdorf has grown up under the tutorship of his father, one of the oldest and best known makers of insulated wire and electrical apparatus in this country. One of the largest manufacturers of magnet wire in the United States adopted the Splitdorf system for insulating wires over twenty years ago and is still manufacturing large quantities of it by this method. The writer has known Mr. Splitdorf personally ever since he first started in business and is well qualified to recommend him to anyone wanting anything in his particular line.



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PORTABLE DIRECT READING

VOLTMETERS

AND

WATTMETERS

For Alternating and Direct Current Circuits.

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LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

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Automobiles.



Marcus Nathan, Manager of the Automobile Show, Grand Central Palace.

THE COMING NEW YORK AUTOMOBILE EXPOSITIONS.

Preparations for the two automobile shows go right along, and, while each manager works independently of the other, the exhibitors seem disposed to consider both together. The Madison Square Garden show, which will run from November 3d to 10th, would of itself be rather short and the exhibition space is exceedingly limited. Following, however, as it will be by the longer show at the Grand Central Palace (Nov. 14th to 24th), with its abundance of space affording a better display, it will give the trade an uncommon opportunity to reach the people of the East. Another point in favor of the Palace show is that it will be held simultaneously with the Horse Show, which is such an important feature in New York that more than 50,000 visitors from out of town attend each year. These Horse Show visitors, both New Yorkers and non-residents, are precisely the people who will be most keenly interested in automobiles. They will naturally pass from one show to another and thus a comparison of motor vehicles with the most modern driving turnouts will be forced upon the visitor. An interview with Mr. Marcus Nathan, the manager of the Palace show, justifies the belief that the comparison will not be unfavorable to the motor vehicles. There will be a large representation at the Palace and many very rich and very costly automobiles will be displayed, most of the concerns who intend to exhibit at the Garden having

already arranged for larger blocks of space at the Palace. This is in part due to the fact that Mr. Nathan has made the terms so moderate that no exhibitor need feel any need of crowding his space. Platforms will be unnecessary and most of what are known as extra charges have been abolished. A vehicle can be shown to advantage in a space 10x12 at a cost of $60 for the whole term of the show. Exhibitors at Madison Square Garden may move their display at any time after the close of that show to the Grand Central Palace at no more trouble or expense than it would take to run their vehicles around Madison Square. All in all it is perhaps the best possible thing that the two shows come so closely together. At former trade shows at which motor vehicles were displayed, notably the Electrical Shows, an extension of time was asked by the exhibitors of motor vehicles. When it is considered that the Electrical Shows ran more than a month and the exhibitors still wanted a longer display, it can readily be understood how natural it is that they should be anxious to follow up their Garden exhibit with one at the Palace, especially since by doing so they reach the Horse Show crowd at precisely the time when they can command the greatest interest.

Conventions.

THE PITTSBURGH MEETING OF THE INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.

The fifth annual meeting of the International Association of Municipal Electricians, held at Pittsburgh, Pa., September 25, 26, 27, 1900, adjourned Thursday morning, September 27. It was the most successful meeting ever held by the association, and the committee of arrangements are to be congratulated upon the success their efforts met with. The papers read were received with great attention and vigorously discussed. The various amusements provided for the visiting delegates were most highly appreciated and taken advantage of.



Morris W. Mead, President-Elect, International Association of Municipal Electricians.

The election of officers resulted in the choice of Morris W. Mead, superintendent of the Bureau of Electricity of Pittsburgh, as president. The next convention will be held at Niagara Falls. The other officers elected were: First vice-president, J. F. Zelleuff, Paterson, N. J.; second vice-president, Benjamin McAllister, Broadford, N. Y.; third vice-president, R. E. Moan, Memphis, Tenn.; secretary, F. P. Foster, Corning, N. Y.; treasurer, Adam Bosch, Newark, N. J.; executive committee, M. J. Donahoe, Niagara Falls; William Brophy, Boston; J. W. Aydon, Wilmington, Del.; F. C. Mason, Brooklyn; F. G. Boyd, Baltimore; M. J. Elliott, Elmira, N. Y.; G. F. McDonald, Ottawa, Canada; M. G. Campfield, Grand Rapids, Mich., and F. C. Michaels, Peoria, Ill. The office of financial secretary was abolished.

After electing officers and passing resolutions of thanks to various people and concerns in Pittsburgh the meeting adjourned. In the afternoon the delegates were given an excursion on the steamer Mayflower up the Monongahela river and visited the great industries along the valley.

ANNUAL MEETING OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION.

The eighteenth annual meeting of the Street Railway Association of the State of New York was held at Buffalo on Tuesday and Wednesday, Sept. 18 and 19, over 100 delegates answering to the roll call. Mayor Diehl welcomed the members of the association to Buffalo, after which President Rogers responded.

Papers were read on "Accidents on Street Railways; Methods Employed in Handling Same and Preparing for Trial," by D. W. Patterson, of the legal department, Metropolitan Street Railway Company, New York; "How Can We Increase the Efficiency of Our Employes?" by E. G. Connette, vice-president and general manager of the Syracuse Rapid Transit Railway Company, of Syracuse; "Railway Power Transmission," by J. H. Armstrong, of the General Electric Company, Schenectady; "The Use of Storage Batteries on Small Roads," by B. B. Nostrand, Jr., president of the Peekskill Electric Light and Power Company, of Peekskill; "Precision in Steam Making," by A. S. Mann; "Practical Experience in the Operation of Combined Public Franchise by One Company," by C. E. Ubelacker; "Compressed Air Motors," by H. D. Cooke; "The Storage Battery; Its Use in Railway Plants," by T. Henning; "Storage Batteries in Railway Power Stations," by Prof H. H. Norris; "Rochester and Sodus Bay Railroad," by T. J. Nicoll, and "Rotary Transformer Stations" and "Snow and Snow Plows," by R. E. Danforth.

After the close of the Tuesday afternoon session the delegates were taken to the Cold Spring power house of the Buffalo Railway Company. After thoroughly inspecting this plant they visited the Pan-American Exposition grounds at the special invitation of Director-General Buchanan. The annual banquet was held Tuesday evening at the Ellicott Club. There was an attendance of about 200. Mr. Rogers presided and Mr. Ely, president of the International Traction Company, was toastmaster.

A number of interesting exhibits were made during the the convention by The Keystone Electric Company, of Philadelphia; Harold P. Brown, P. H. Alexander, The Speer Carbon Company, The Edison-Johnson Electric Manufacturing Company, The National Carbon Company, Morris Electric Company, The Cutter Company, of Philadelphia; The Gold Street Car Heating Company, Consolidated Car Heating Company, Couch & Seely Company, of Boston; Mayer & Englund, H. W. Johns Company, The Bierbaum & Merrick Metal Company and G. S. Allison.

MEETING OF THE AMERICAN STREET RAILWAY ASSOCIATION AT KANSAS CITY, MO.

The nineteenth annual meeting of the American Street Railway Association will be held at Convention Hall, Kansas City, Mo., October 16, 17, 18 and 19. Papers will be read on the following subjects:

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions."

"Comparisons of the Various Systems of Electrical Distribution for Street Railways."

"Consolidation of Street Railways and Its Effect Upon the Public."

"The Store Room and Store Room Accounts."

"Painting, Repainting and Maintenance of Car Bodies."

Friday, October 19, has been set apart as a day for the examination of the exhibits. No session of the Association will be held, so that all may have plenty of time to view the exhibits. It is earnestly requested that managers have their heads of departments present on that day.

The annual banquet will be held at the Coates House Friday evening, when the officers-elect will be installed.

The headquarters of the Association will be at the Midland Hotel.

The following are the hotels and rates: Midland, American plan, $3 to $6 per day; European, $1 to $5; New Coates, American, $3 per day and up; European, $1; Savoy, American, $2.50 to $6 per day; European, $1.50 to $3.50; Baltimore, American, $3 to $5 per day; European, $1.50 to $3.

The executive committee advises all who desire rooms to apply at once.

The Passenger Associations have granted a rate of one and one-third fare, on the certificate plan, provided one hundred or more tickets are purchased. Be sure and get a certificate when you purchase your ticket and deposite the same with clerk upon your arrival at the hall. He will have it signed and ready to be returned to you on Thursday, October 18. You cannot get return ticket at reduced rate if you fail to get certificate when you purchase your ticket.

The eastern committee charged with the duty of making transportation arrangements for the Kansas City annual meeting of the American Street Railway Association announces that the train will leave the New York Central station at Forty-second street at 1 p. m. Sunday, Oct. 14, and Boston at 10.45 a. m. The united party will leave Albany at 4.30 p. m., and Cleveland at 3.35 a. m. on Monday, going then over the Big Four, and arriving at St. Louis at 6.45 p. m. It will leave St. Louis over the Wabash at 10.15 p. m., and arrive at Kansas City at 7 a. m. on Tuesday, Oct. 16, the opening day. The train will consist of Pullman cars, with dining car, and a special representative of the New York Central will accompany the delegation all the way. The rate is one and one-third fare on the certificate plan. Fare from New York, one way, is $31.75; sleeper, one way, $7.50. If the number will warrant, arrangements will be made for a special train from New York Sunday morning about 110 a. m., arriving at Kansas City Monday evening. The committee and Mr. Milton C. Roach, general eastern passenger agent of the New York Central, 1216 Broadway, therefore earnestly request an early notification from all who intend going, so that if possible the necessary plans for such a special may be made. The committee for New York are H. H. Vreeland, J. H. McGraw, Chas. W. Price and T. C. Martin; for Boston, Chas. S. Clark, 8 Oliver street.

The Incandescent Lamp.

INCANDESCENT LAMPS.*

BY FRANCIS W. WILLCOX.

(Continued from page 100.)

The diagram, Fig. 2, gives the result of an initial test on 100 lamps, which were sold for 16 candle-power 50-watt lamps at 116 volts. The lamps average about right in candle-power and watts, but scatter considerably outside the limiting rectangle. In Fig. 3 we have 100 more of the same make of lamps. The difference between these two lots is that this last is a lot purchased in the open market, while the former lot was a special one direct from the manufacturer. This illustrates the difference between special and regular lamps, and the need of the precaution in regard to securing the average product for a test. An examination of diagram, Fig 3, will serve to show the value of correct and uniform rating.

First—In candle-power we have a range of from nine candles to sixteen candles, an extreme difference equal to one-half of the rated candle-power. With such contrasts as this between lamps in service, the result will be,

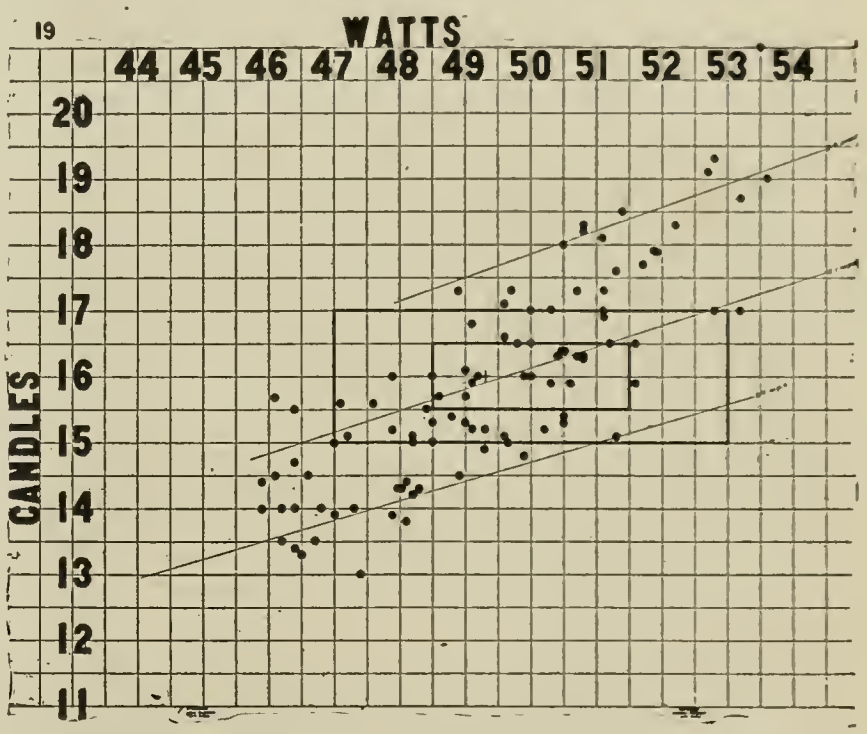


Fig. 2.—Target diagram showing initial measurements at marked voltage of 100 lamps, rated at 16 candle-power, 50-watt lamps.

Second—In watts we find a range from 47 to 50 watts. This means trouble for the meter man, and complaints from customers. There are over a dozen lamps in this lot taking from 15 to 20 per cent. more power than their rating calls for.

Third—In efficiency we note the lamps rated as 3.1-watt lamps have a real efficiency of 4½ watts. This shows the reduction in efficiency, resulting from low candle-power. Such lamps if measured for wattage would probably pass as 3.1-watt lamps, but when candle-power measurements are made the real watts per candle are shown to be 4½. In a number of other cases of lamps incorrectly rated, lamps have been found to run high in candle-power, which is as grave a defect as running under candle-power. Lamps that run high in candle-power will be naturally strained at a higher efficiency than lamps nominally and correctly rated. Candle-power performance and service of these lamps will, therefore, be as erratic and non-uniform as is their initial rating. The heavy decline in candle-power due to incorrectly rated lamps (running high in candle-power) is well shown in diagram, Fig. 5, which gives performance of a

*Read before the Franklin Institute.

number of lamps (rated as 16 candle-power) giving maximum candle-power readings.

Thus in a threefold degree is close and uniform rating necessary if we desire to secure good life and the best service results. It takes experience and ability to make lamps

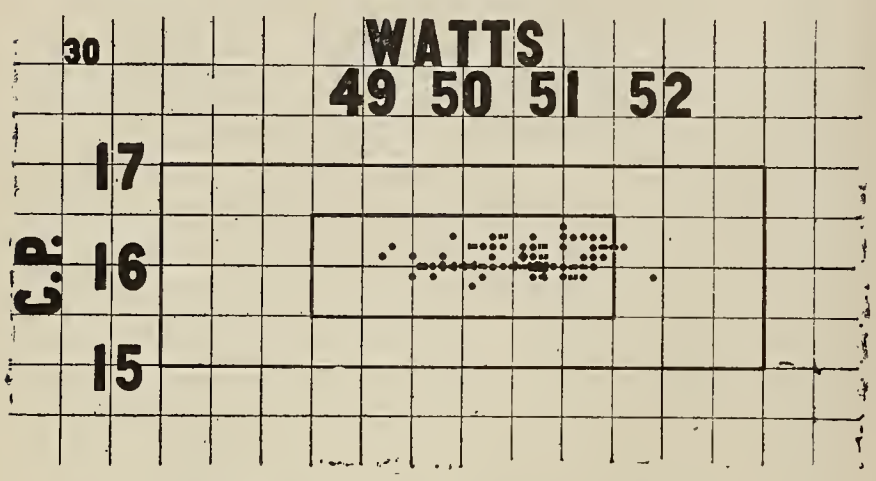


Fig. 4.—Target Diagram showing result of correctly rated lamps.

correct and uniform, and it costs money to select them to their close limits. Any attempt here to save money by the manufacturer would add greatly to the cost of renewals to the purchaser. It is, therefore, money saved for the purchaser to pay for these essentials, that is, purchase from the competent and capable manufacturer.

Diagram, Fig. 4, shows the results of test on 100 lamps of a high-grade lamp, and illustrates what may be expected of well-made lamps.

It is to the interest of all purchasers to require lamps to conform to the one candle, 3-watt limits referred to above, by testing samples from each lot purchased, and rejecting every lot failing of these requirements.

There is no need of further testing any lamps that fail in this respect.

In comparative tests of lamps, as many lamps as possible should be tested for initial rating—from 50 to 100 or more. This gives a full average of results, and besides provides a sufficient quantity from which to choose lamps of the efficiency taken as a basis for the candle-power performance test.

CANDLE-POWER PERFORMANCE.

Tests of this character have frequently been made, but not always with a regard to the necessities of the case. Curves of candle-power have often been published without any statement of the efficiency at which the lamps were started.

This is of the first importance—to have the efficiency definitely known and accurately determined to within 1-10 of a watt. It is not generally appreciated how important this is. A difference of 1-10 of a watt per candle is sufficient to make a difference of 100 hours of life performance. Therefore in testing it is a prime requisite to have lamps under test start at an exact equality in average efficiency. If the lamps pass the initial test as to close rating, then the number to be set up for life test

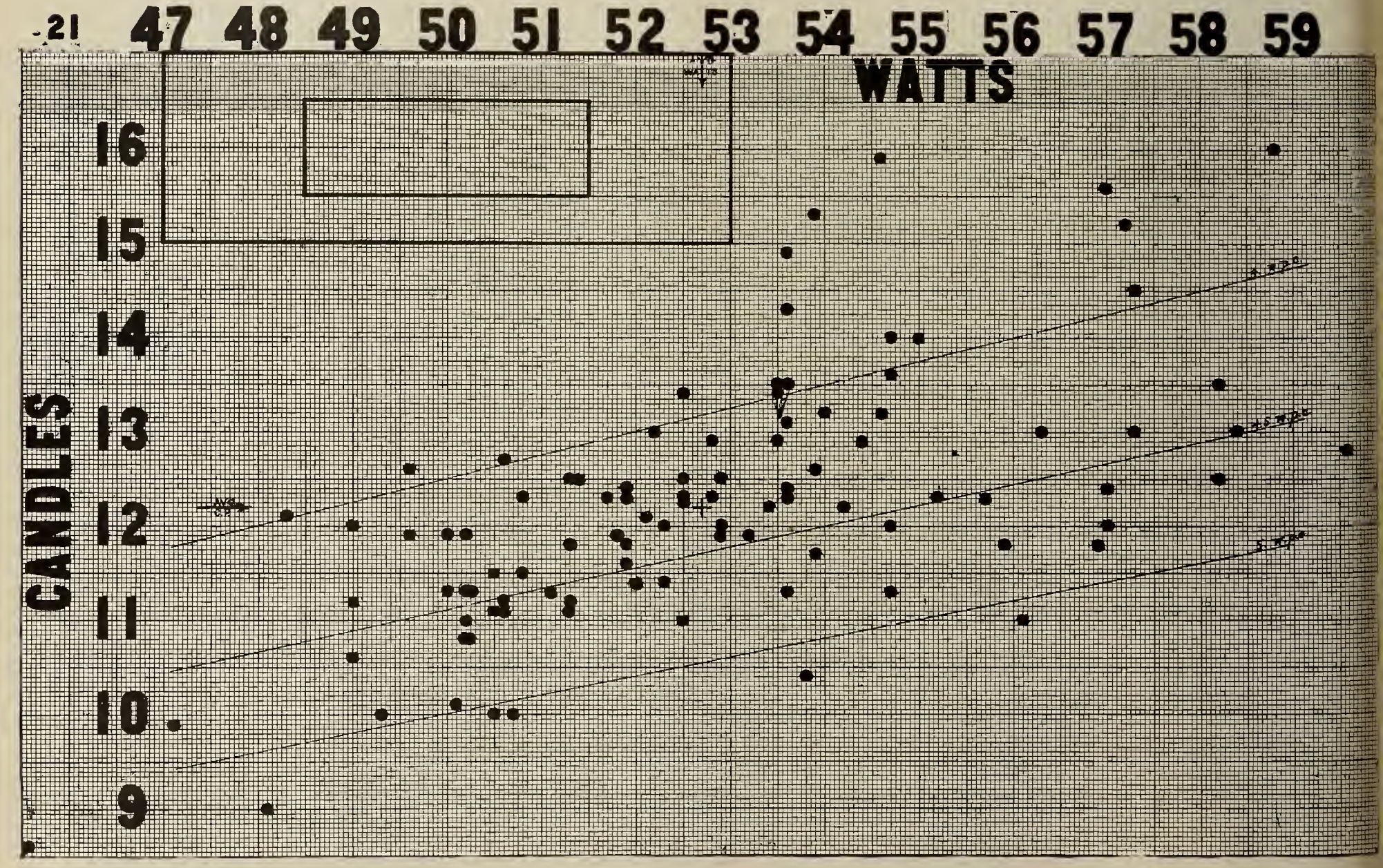


Fig. 3.—Target diagram showing initial measurements at marked voltage of 100 lamps rated as 16 candle-power, 50-watt lamps, illustrating very inaccurate rating.

can be selected so as to average the desired efficiency. For example, in the case of lamps on diagram, Fig. 2, we would select for test those along the 3.1-watt line. The economy chosen as a basis for test is generally the highest possible, as this shortens the period of test. For this reason 3.1 watts per candle is preferable, as test need

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NEW YORK, OCTOBER 6, 1900.

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THE MEETING OF THE MUNICIPAL ELECTRICIANS.

The meeting of the International Association of Municipal Electricians at Pittsburg, Pa., last week, was very successful in a scientific and social sense. The duties of municipal electricians who congregated at Pittsburgh from every State in the Union are so diversified that almost every recent application of electricity of municipal importance was represented there. The growing use of electricity in almost every available field of work has meant a tremendous investment of capital. Occupations which did not exist ten years ago have been developed through the use of electricity and occupy an important place in the economics of city life with reference to municipal service. The municipal electricans have much to be proud of. Their work is mainly practical and the satisfactory performance of it is about all that the city requires of them. Yet many of the members of this aggregation have gone much further than this. They have suggested and made valuable improvements in systems and apparatus used by the city, thereby betraying an intimate knowledge of fundamental principles in a spirit of progress highly commendable. The heterogeneous nature of the tasks allotted to municipal electricians makes us realize that it is beyond the power of any single individual to thoroughly grasp the details of each, and this system of dividing the work up is indicative of a practical appreciation of the difficulties to be met with in rendering the city a most efficient service. The instruction to be gained from these meetings is of the greatest value, individually and collectively, and we think the day is not far away when the meetings of the municipal electricians will possess enormous importance in the eyes of the general public.

THE INCREASING POPULARITY OF AUTOMOBILE EXHIBITS.

Shall we say that the prancing steed has had its day and is about to be relegated to the dust heap of antique fashions? Or that the automobile is just beginning to call for public attention through the enormous possibilities it is capable of in city and suburban use? If any influence is going to mark an epoch in history it is the influence of the automobile. As familiar as it is to those engaged in its construction it is still a strange animal to many millions of adults in the United States. This is most evident on gala days when Jonathan comes to town with wife and family and gazes open-mouthed at the horseless phaeton. The increasing popularity of automobile shows is the inevitable result of competition among manufacturers; of the desire of purchasers to view in close proximity the different types, and of clubmen to show the paces of the electric steed. The automobile shows of the next decade are bound to be functions of great interest as well as affairs of magnitude. We have not seen all the types of automobiles that will be required in the near future although those already in use would constitute a long procession. The tendency is to make them fast and light, capable of standing great strains and covering long distances. We read of W. K. Vanderbilt, Jr.'s trip from Newport, R. I., to New York. It reads almost like the story of the first trip in a steam carriage in London. The automobile is not five years old in this city, yet within that time cab and stage services have been established. The daily newspapers use them for delivery service, the drygoods stores employ them and the large express companies are giving them the fairest of trials. It is no wonder that we have a dozen or more automobile shows a year.

THE TREND OF MODERN SCIENTIFIC RESEARCH.

The chemist, the biologist, the physiologist and the mathematician have set themselves to solve great problems. The scope of the work each has mapped out for himself calls for herculean labor to successfully accomplish. The processes of analysis employed and the accuracy with which results are calculated and measured leaves little room for doubt when they are made public. The trend of modern scientific research is, however, leaving the details of science and dealing with its generalities. The chemist desires to know the meaning of an atom and the processes through which, from the world matter it represents, the infinitely varied forms of metal and mineral come into being. The biologist seeks for truth that can hardly be expressed in other than metaphysical language. The physiologist examines for the seat of nervous energy, and thus each, including the mathematician, treads the same ground again and again, inventing new methods of investigation, reasoning out new forms of experiment. The latest and most brilliant series of conclusions drawn from the data of scientific knowledge are in relation to the phenomena of gravitation. Since the days of Sir Isaac Newton and the discovery of the laws of gravitation absolutely no advance has been made in the way of explaining this mysterious and universal force. It seems from the suggestions offered by Prof. Reginald A. Fessenden that an explanation might be forthcoming of a purely electro-magnetic character that inertia and attraction and all gravitative influences would be better understood with reference to the principles of electricity and magnetism. It would seem from this that a more intimate knowledge of the construction of matter and of the mechanism of ether actions would become known and the distinct lines now drawn between the various fields of scientific research would blend and disappear.

not be continued longer than 400 hours, while with 3.5-watt lamps the period would be over 600 hours, and with 4-watt over 1,200 hours.

Not only must economy be exact, but the candle-power and voltage must be similar. It will not do to compare 50-volt lamps of one make with 100-volt of another, or 10 candle-power with 16 candle-power.

The number of lamps to be tested should preferably be twenty-five or more of each make, and never less than ten. Any less number is not sufficient to give a safe average.

The voltage during test should always be kept normal and constant. An average increase of but 1 volt in pressure during test will decrease the result 10 per cent., and a volt decrease in pressure will increase results in same ratio.

The candle-power readings may be continued indefinitely, but the practical method is to continue results to some agreed limit of comparison. The limit most generally taken is 80 per cent. of the initial candle-power, which would be, for the 16 candle-power lamp, the 12.8 candle-power line.

Here are several sets of candle-power tests* plotted on diagrams in the usual manner, with the ordinates representing candle-power and the abscissae hours of burning. An examination of these will show us some features of interest.

Diagram, Fig. 6, shows the miserable results some makes of lamps will give. Here are ten lamps set up at an average economy of 3.5 watts per candle, and six of them lost over 20 per cent. in candle-power inside of ten hours, only three lamps giving any life at all. Such a lamp no station could afford to use even if a bonus were paid on each lamp. Yet the manufacturer of this lamp glibly made a contarct with the United States Government to furnish lamps under specifications that not more than three manufacturers in the world could regularly fulfill.

Diagram, Fig. 7, exhibits an interesting set of curves of ten lamps started off at 3.12 watts per candle. This illustrates the bad effects of a rise in candle-power at starting. Owing to this rise in candle-power, readings should be taken every 25 hours for first 100 hours. All lamps rise some at the start, but this rise should be limited, as, in excess, it strains the filament and causes early breakage, as is here well exemplified. Two of the

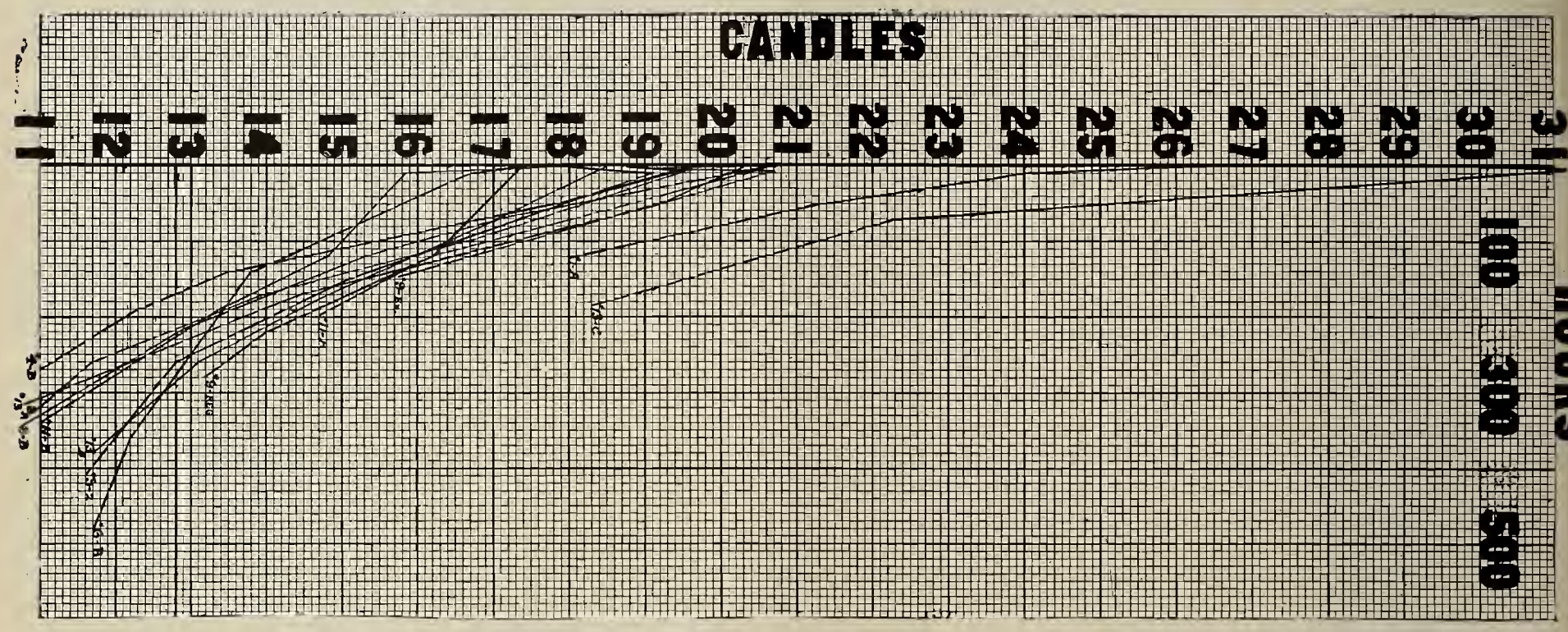


Fig. 5.—Showing rapid decline in candle-prwer of lamps measuring high in candle-power—well above their nominal rating.

lamps slumped badly, and one of the curves shows a curious recovery feature, regaining three candles to 13 candle-power, after having dropped to 10 candle-power.

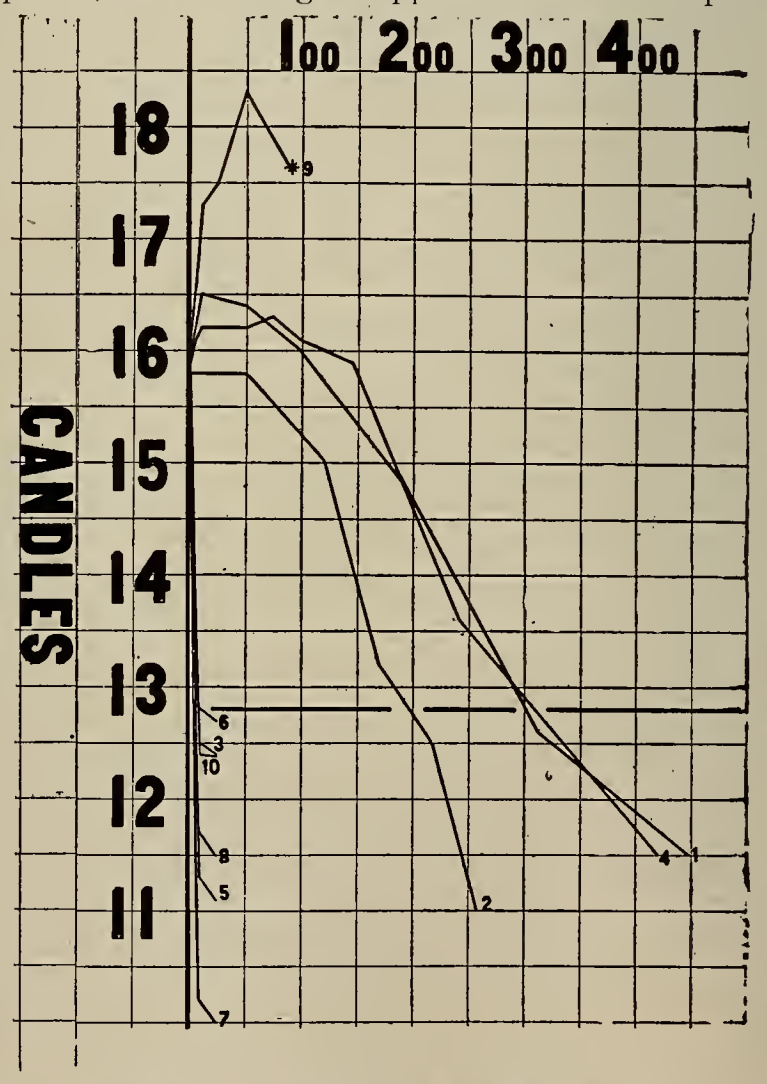


Fig. 6.—Candle-power performance diagram, showing poor results given by 16-candle-power 100-volt lamps—3½-watt lamps.

This is a freak of performance that has been considered impossible, but it is quite often met with in lamp testing. The explanation of this is that the filament of the lamp had a discolored or blackened surface (though bad

*The writer wishes to acknowledge indebtedness to the Association of Edison Illuminating Companies for many of the diagrams used herein.

vacuum), and, as such a surface is a poor radiator of light, the candle-power declined very rapidly for the first twenty hours, as shown. The vacuum improving as the inevitably, bad lightning and complaints from customers. lamp continued to burn, the sooty, discolored coating on the filament was burned off. This made the filament a better radiator of light, and so caused the subsequent rise in candle-power shown.

It will be noted that in all these diagrams the individual curve of each lamp is plotted. This serves to illustrate the degree of uniformity of performance, and is a great improvement upon the old methods of averaging results and plotting only one curve.

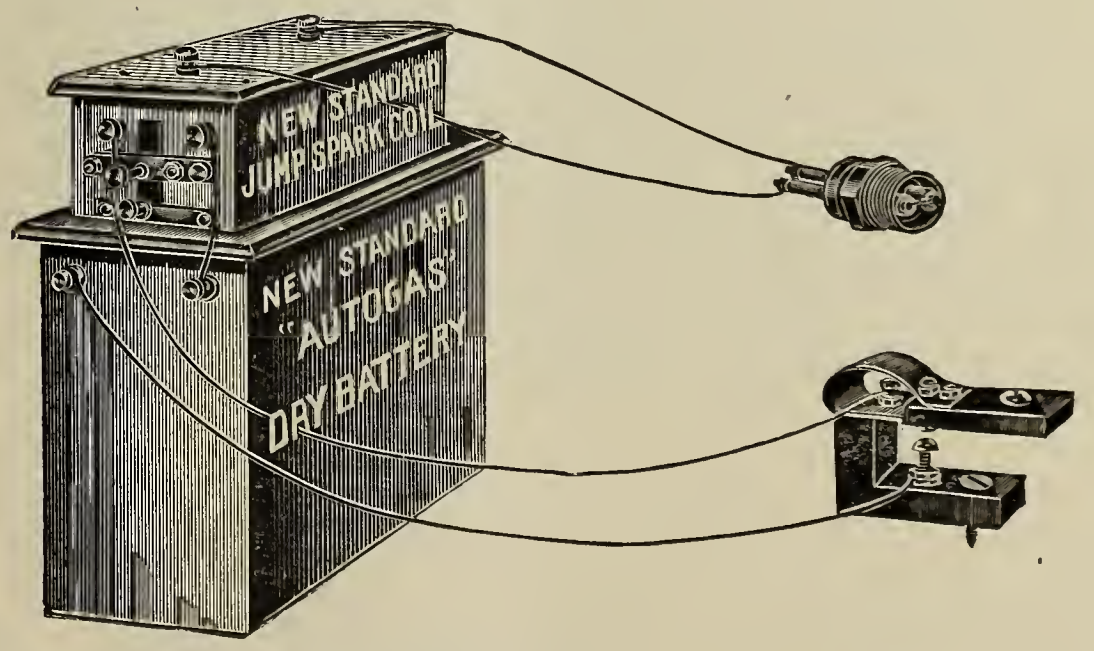
In diagram, Fig. 8, we have a set of curves showing how well-made lamps should perform—illustrating good results and great uniformity.

(To be concluded.)

Specialties.

THE NEW STANDARD SYSTEM OF ELECTRIC IGNITION FOR GAS, GASOLENE OR OIL ENGINES.

In this system of electric ignition double insulating porcelain tubes carrying the current conductors—which transmit the jump spark to the inside of the cylinder of the engine—are run through a metal plug. Two insulated wires are run from the cam on the engine direct to the spark, which acts through the New Standard jump spark coil. In all other systems the engine itself is used to conduct the current on one side of the line, thereby causing great inconvenience in the insulation of the engine. Very often poor insulation will cause a closed circuit by the use of this system, which is frequently dangerous in its operation. In the New Standard system all possibility of short circuits is avoided as the two conductors are heavily insulated against water, dampness, fire, etc., thus making the wires proof against any possible chance of closed circuiting. The system is operated by the New Standard Auto-Gas battery, connected up in a common series of eight cells. Four of the cells are tapped on and when these become weak either one or all of the eight cells can be thrown into circuit, as each cell bears a number on its contact post on the top of the battery. The manufacturer of the above is William Roche, 42 Vesey street, New York city, who will send further details regarding prices, etc., an application.



"New Standard" Spark Ignition System Complete.

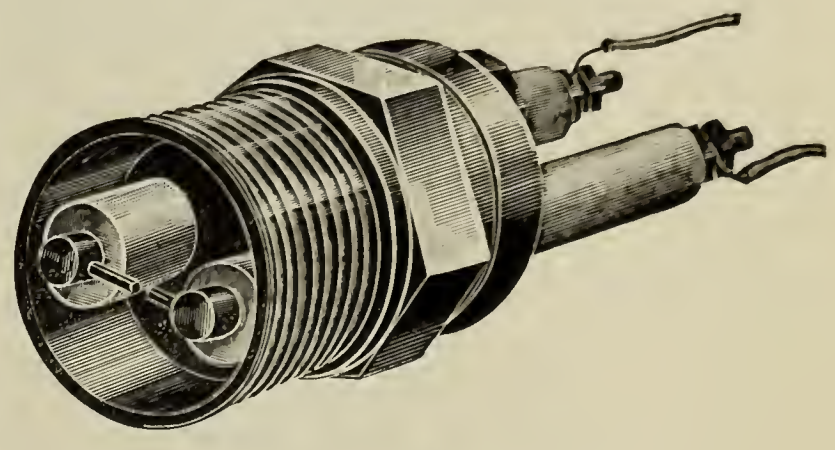
Patents.

WEEKLY ELECTRICAL PATENT RECORD.
PATENTS ISSUED SEPTEMBR 18, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

657,908. Speed regulator for dynamos. P. W. Alexander, Tifton, Ga.

657,910. Metallic cement for electric conductor joints. W. F. Barber, Wilkesbarre, Pa.



"New Standard" Sparking Plug.

657,911. Apparatus for separating metals from ores by electricity. G. D. Burton, Boston, Mass.

657,983. Electric meter. J. Harris, Lynn, Mass.

657,984. Electric measuring instrument. J. Harris, Lynn, Mass.

658,012. Dynamo-electric machine. M. H. Hurrell, Wimbledon, England.

658,013. Method of locating concealed water pipes. F. T. Iddings, Washington, D. C.

658,022. Maximum electrical current indicator and recorder. E. C. Rimington, London, England.

658,027. Therapeutic device. A. W. Steiger, Boston, Mass.

658,064. Switch for alternating electric currents. B. Hopkinson, London, England.

658,075. Electric railway system. W. Robinson, Bos-

ton, Mass.

658,100. Armature for multipolar dynamos. J. J. Wood, Fort Wayne, Ind.

658,117. Automobile maximum speed governor for electrically propelled vehicles. H. F. Parshall, London, England.

658,192. Electric conductor. F. C. Sutter, Pittsburgh, Pa.

658,225. Circuit controller. C. C. Webster, Asbury Park, N. J.

658,235. Secondary battery. Victor Cheval, Brussels, Belgium.

658,237. Electrical warp stop-motion for looms. J. Coldwell, Fall River, Mass.

658,238. Motor vehicle. C. J. Coleman, Chicago, Ill.

658,239. Automatic feed-water regulator. C. J. Coleman, Chicago, Ill.

658,299. Electric gas lighter. N. de Thiersant, London, England.

658,301. Telephone relay. W. G. Urmson, New Brunswick, N. J.

658,315. Electric furnace. A. H. Cowles, Cleveland, Ohio.

Business News.

NEW INCORPORATIONS.

Syracuse, N. Y.—The Archibald-Brady Company, of Syracuse, has been incorporated to construct street surface railroads, electric lighting plants, telephone, telegraph and gas plants. Capital, $50,000; directors: William K. Archibald, New York city; Paul T. Brady and Robert E. Drake, Syracuse.

Hoosick Falls, N. Y.—The Hoosick Falls Electric Company has been incorporated to furnish electric light and power. The company has a capital of $85,000, and the directors are: Willis E. Keton and Ezra Tiffany, of Hoosick Falls; George W. Davenport, of Winchester, Mass.; Owen D. Young, of Cambridge, Mass., and Clarence N. Grey, of Boston.

Montgomery, Ala.—A consolidation has been effected between all of the local street railways and electric companies involving a combination of over $3,000,000 of capital. The combination includes the Montgomery Light and Power Company, representing a million and a half invested; the Montgomery Street Railway Company and the water power companies of Montgomery, a million and a quarter. The bonded indebtedness of the combination will be $2,100,000. The details of the consolidation have not been arranged, but the scheme has progressed sufficiently to make its early accomplishment a certainty.

TELEPHONE CALLS.

Honey Grove, Tex.—The Honey Grove & Ragsdale Telephone Company, with principal office at Honey Grove, has been incorporated. Capital stock, $1,200; incorporated by: J. W. Underwood, P. M. Price and T. U. Cole.

Greensburg, Ind.—The Greensburg Telephone Company has filed articles of incorporation with the Secretary of State. Capital stock, $500,000; the incorporators are: A. P. Bone, W. B. Hamilton and D. A. Myers. The company proposes the erection of a line and to operate in Decatur, Franklin, Rush, Shelby, Bartholomew, Jennings, Ripley and Dearborn counties.

Charleston, S. C.—The American Duplex Telephone and Telegraph Company has been incorporated with a capital of $1,000,000 to do a general telegraph and telephone business. The incorporators are: J. E. Scraggs, E. L. Wood, C. R. Burdette, A. H. Wilson, Jr., J. E. Chilton, all of Charleston; Chilton, MacCorkle & Chilton, attorneys, Charleston.

STREET RAILWAY NEWS.

Selma, Ala.—The Selma Street Railway Company has been organized, with a capital stock of $50,000. The officers are: F. M. Abbott, president; B. Marion, secretary and treasurer; A. W. Hall, superintendent; A. D. Pitts, counsel. The stockholders are northern men.

Elizabethtown, N. Y.—The Elizabethtown & Westport Railway Company has been incorporated by the Secretary of State to build a surface road 10 miles long, from Elizabethtown to Westport. The capital is $200,000, and the directors are: G. P. Hopkins, M. S. Decker, John Willoughby, of New York, and A. Van Vechten, of Elizabeth, N. J.

CORPORATION CHANGES.

Milwaukee, Wis.—The Cutler-Hammer Manufacturing Company, manufacturers of electric controlling devices, has increased its capital stock from $150,000 to $200,000.

LEGAL NOTES.

Easton, Pa.—The Easton Power Company, Easton, Pa., has commenced suit for $75,000 against the Siemens & Halske Electric Company in the United States Circuit Court, at Chicago. Breach of contract is alleged in the bill of particulars.

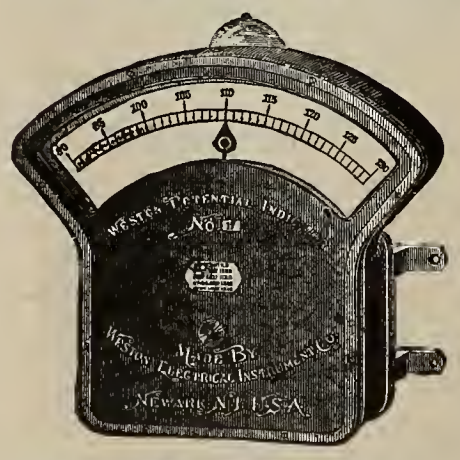
NEW YORK NOTES.

THE PIANOPHONE COMPANY, of Brooklyn, N. Y., makers of the only complete and operative electric piano playing attachment, are meeting with great success in their new quarters. Mr. Davis, the president of the company, reports a daily increasing demand and states that on one day during the past week orders were received for twelve of their outfits with pianos.

J. JONES, JR., of The J. Jones & Son Company, 64 Cortlandt street, manufacturers of electric light and power switchboards, panel boards, switches, etc., and dealers in all kinds of supplies, has returned from the Municipal Electricians' convention at Pittsburgh, Pa., feeling very much pleased with his trip.

THROUGH A TYPOGRAPHICAL ERROR the Middle initial in Mr. Chas. W. Mackey's name in the article "The Electric Tripartite Steel Pole," published in our issue of September 29, 1900, was omitted. Mr. Mackey is the president of the Electric Tripartite Steel Pole Company, of 253 Broadway.

WESTON STANDARD ILLUMINATED DIAL



STATION INSTRUMENTS.

THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 15. NEW YORK, OCTOBER 13, 1900. Whole No. 700.

Conventions.

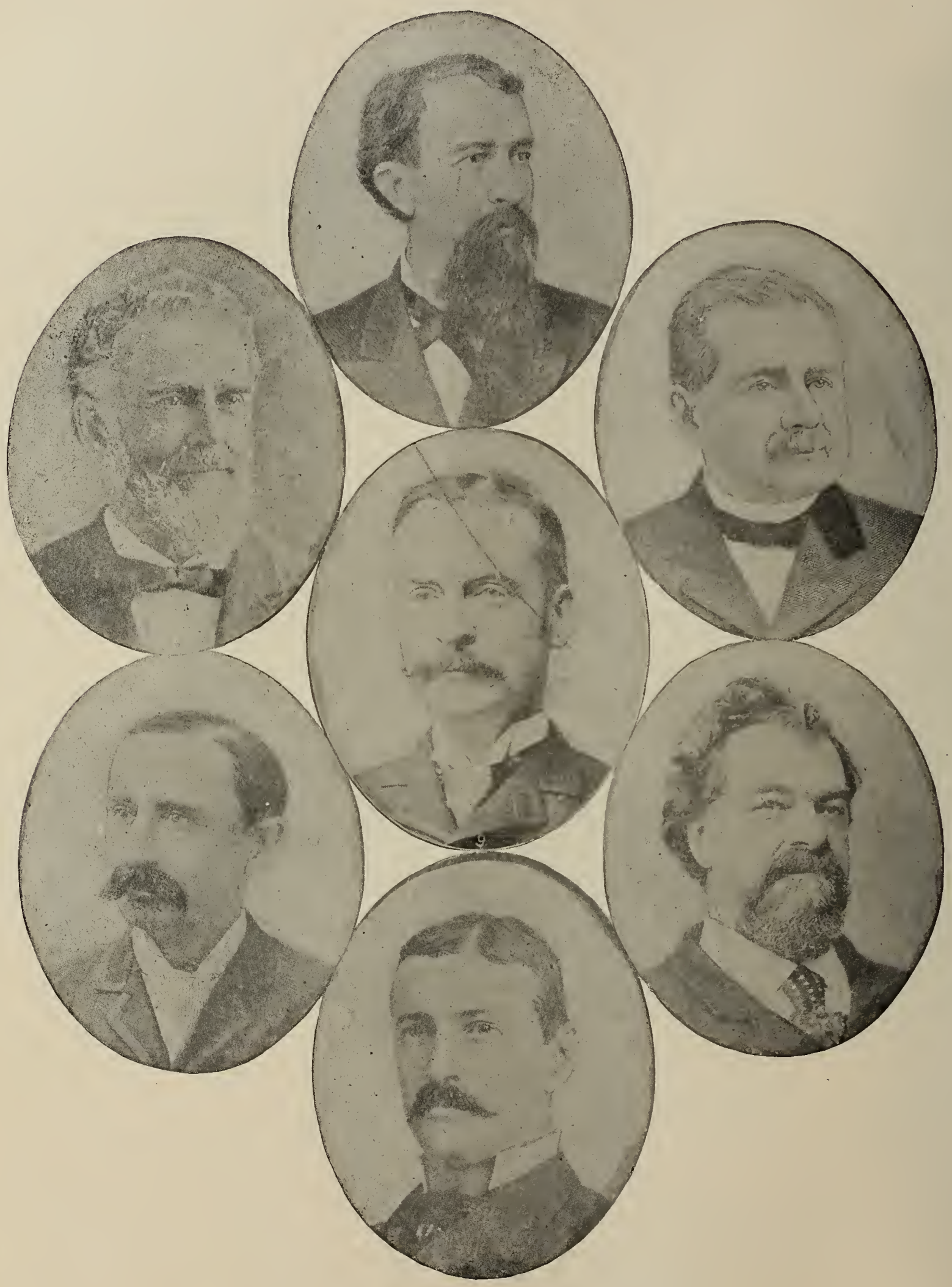


John Millard Roach, President, American Street Railway Association.

THE NINETEETH ANNUAL MEETING OF THE AMERICAN STREET RAILWAY ASSOCIATION.

The State of Missouri will welcome the delegates coming from all parts of the United States to attend the nineteenth convention of the organization known as the American Street Railway Association. The meeting will be held at Kansas City, the town noted for its sudden rise into prosperity, its marvelous growth and the development of electrical interests that relate to the most important branch of the industry. The gathering of electrical pople will be held at Convention Hall, at which many exhibits of interest to the street railway people will be given. The custom of calling conventions for places widely separated from each other has great advantages in giving the East a chance to see the West and the western railroad men a chance to see the East. The previous convention was held at Chicago at the Auditorium and the one before at Boston; those previous to these being held respectively at Niagara Falls and St. Louis. The chain of cities extending across the continent have each enjoyed the opportunity of welcoming the gentlemen representing the above association.

The vast aggregation of capital the street railways of the United States now amount to builds up to astonishing figures. The United States is certainly the home of the electric railroad and now contains more than twelve thousand miles of road and more than forty thousand cars. The constant increase in these figures makes

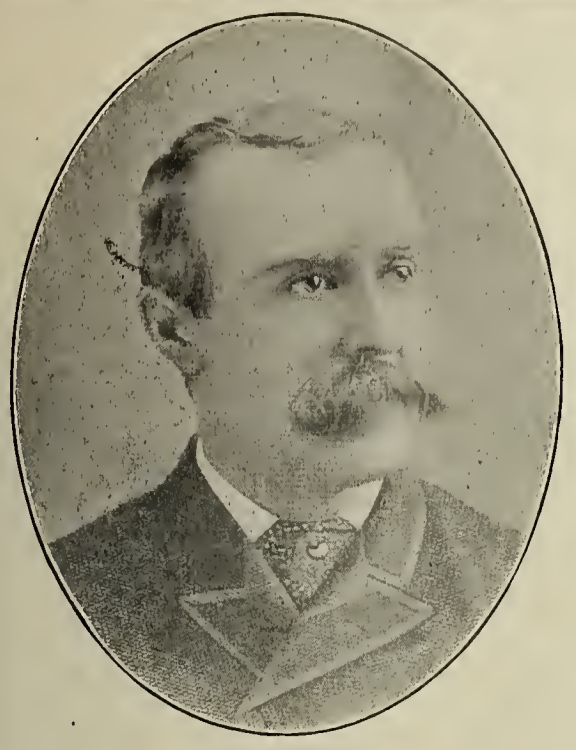


W. H. Hazzard.
H. H. Littell.

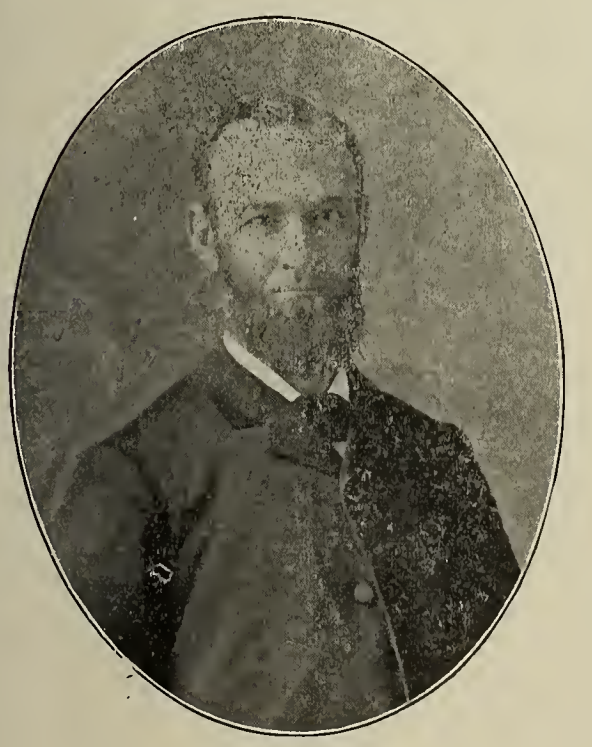
Thomas Lowry.
John G. Holmes.
J. S. Walsh.

T. W. Ackley.
C. A. Richards.

A Group of Past-Presidents of the American Street Railway Association.



D. F. Longstreet.



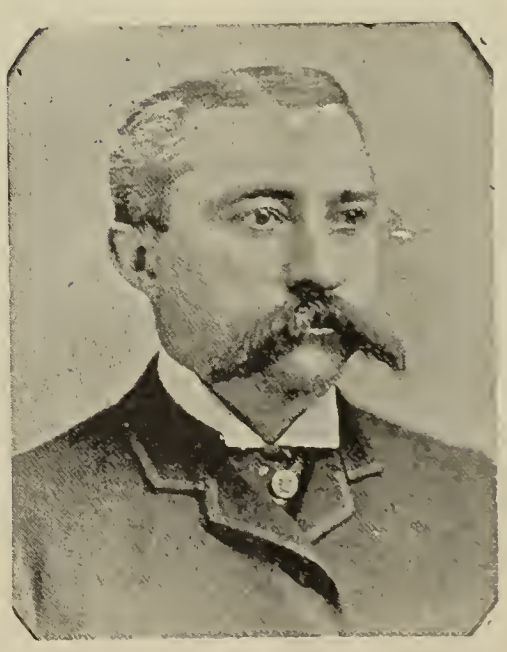
C. B. Holmes.



G. B. Kerper.



C. S. Sergeant.



H. M. Watson.



H. C. Payne.

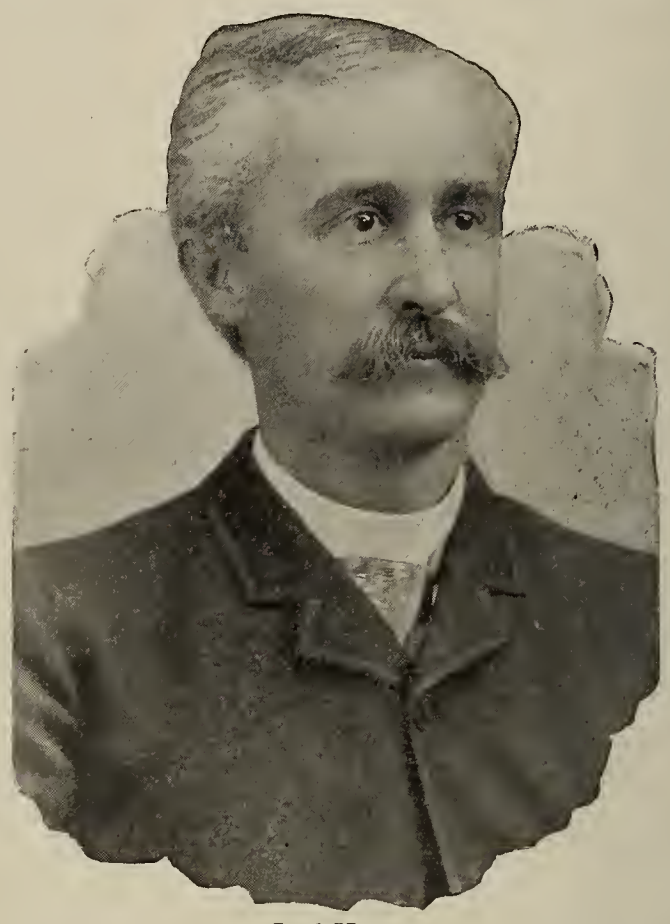
A Group of Past-Presidents of the American Street Railway Association.

it likely that within another two or three years they may be nearly doubled, as new roads are springing up like magic in all parts of the United States. The little town is being welded to the bigger town, the bigger town to the city and the city to all suburban points of interest.

honor and prominece. Mr. John Millard Roach, the president, is a typical American as far as his life and final success are concerned. His career was a varied one. He was born in Noble County, Jackson Township, Ohio, in 1851, leaving the State when eleven years of



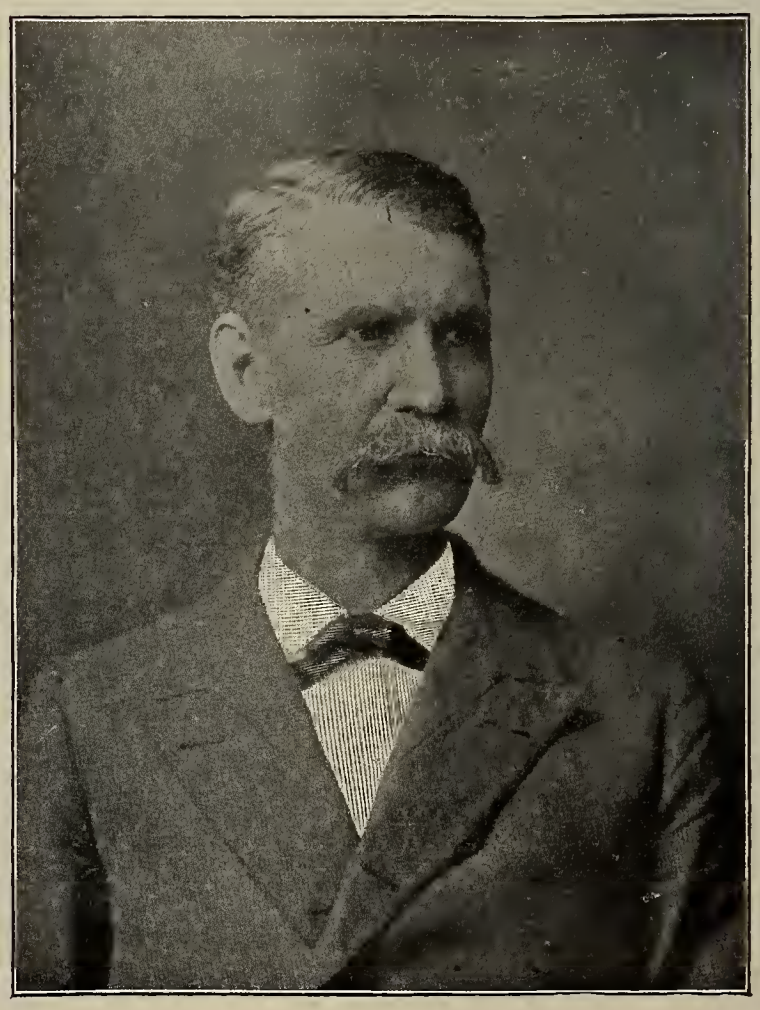
H. M. Littell.



Joel Hurt.



Albion E. Lang.



Robert McCulloch.

A Group of Past-Presidents of the American Street Railway Association.

The association has developed to an extraordinary degree since the street railway business has become established throughout the United States. The position of chief executive is now and has been one of great

age. After a short high-school training he left for Corinne, Utah, then Helena, Mont., prospecting for gold in the interim. He rode a broncho through almost inaccessible parts of the West until he settled in Chicago

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.
JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

NEW YORK, OCTOBER 13, 1900.

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A CONFESSION OF ENGLISH MANUFACTURERS.

There are certain fixed rules for success which are supposed to be effective in inviting progress, but the successful man is one who adapts himself to circumstances although many explanations are afterwards given of his methods. To explain success is therefore much easier than to gain it. We find that the London "Electrical Review," in an editorial entitled "The Construction of Large Dynamos," states that "in America the necessity for large generators, both for lighting and tramway work, has existed for a long time and this fact has enabled American manufacturers to get ahead in the matter of experience." We admit the truth of this statement, but cannot consider it in toto the correct answer. The success of American manufacturers is partly due to their anticipatory knowledge, to a far sightedness as manufacturers and ability, as it were, to build a thing before it is needed and have it ready for use when the critical moment arrives.

Of course, experience will be of the greatest assistance in remodelling machinery to adequately meet conditions in all respects, but of itself it does not possess the initiative element required to make American manufacturers the foremost in the world. The British engineers possess an excellent academic training and their experience in practical work covers a great range of scientific application, but the opportunities in England are not as great as they are here either for enterprise or observation. There is therefore a reason why large American generators are better than those of Continental or English make. At the Paris Exposition opportunities were given to the manufacturers of the world to openly compete and it seems as though the palm is to be given to American manufacturers. In the editorial we refer to the writer admits the backwardness of the British manufacturer, of his slowness in advertising, of the fact, as he states, that "the British manufacturer is neither as bad nor as good as he has been painted but he needs a bit of shaking."

The English are certainly well acquainted with the construction and design of alternating current machines, but only those of the type confined to the development of single phase current. In America, on the other hand, not only has success been attained in the field of direct current machinery and in the construction of direct current generators of enormous size, but in the construction of two and three phase machines and the apparatus relating to their use. As our English friend confesses the demand for this last mentioned class of machinery is very limited in his own country and the reason, as we can see, is that they have not the same natural facilities to make use of as in America. A huge waterfall, even situated at an almost inaccessible point miles away from civilization, is utilized for the generation of electric power and polyphase systems are installed in such cases, giving to some neighboring town the benefit of a cheap and continual supply of power.

In a limited locality like England there are few if any opportunities of this nature and power transmission is consequently in an undeveloped state. But of late the advantages of this system have been better recognized even where natural sources of power do not exist and in many of the large English towns owning street railways polyphase systems are being adopted. No matter from what standpoint the condition of affairs may be regarded from abroad it is plainly evident that American progress and enterprise, aided by the American way of doing things, enables this country to turn out generators that are larger, more efficient and finally much cheaper than those of our English cousins.

THE COST OF GAS ENGINE ELECTRIC LIGHTING.

The advent of the gas engine is like the entrance of a new power in the industrial world. The manager of an electric light station, the proprietor of a large hotel or apartment house, or even the private city resident owning his own home, would do well to examine into the cost and inadvertently the advantages of electric lighting by gas engines. A cubic foot of gas contains at least one thousand thermal units. It is a simple matter of scientific exposition to prove that when the explosive power of gas is used more light can be obtained from it than by its simple combustion in the burner. The cost of gas in New York city for illuminating purposes is rather high, but special arrangements may be made where gas is used in large quanities, as in a gas engine, for instance, whereby the cost may be greatly reduced. It is known that small gasolene engines driving ten-light dynamos, of sixteen candle power apiece, will operate at an expense of about a cent an hour. In such a case, where the efficiency is very low, the cost per light naturally reduces as the horse power of a plant increases. Some gas engine manufacturers guarantee a gas consumption not exceeding seventeen cubic feet per horse power hour. On this basis the total expense would average up one cent per horse power hour. In New York city quite a few private establishments and stores are using the gas or gasolene engine as a source of power for electric lighting and the continued use of the system is an indication of the saving and advantages its use implies. Some few store keepers who own plants of this description believe that the cost is reduced to about one-half of the charges of metered current. A saving of fifty per cent. is certainly worth the attention of interested parties.

in 1872 as a conductor of the North Chicago Railway Company. After four months he entered the office. In 1889 he was made general manager of the North Chicago Street Railway Company; in 1897 he became the general manager of the West Chicago Street Railway Company, and is now general manager of the Chicago Union Traction Company, having risen to the top notch of his profession.

The past presidents and officials connected with this organization date back to a very early periods in its history. The first meeting was held in Boston September 12, 1882; since then, during a period of nineteen years, extraordinary changes have taken place in relation to street railway work and this now powerful organization crystallized into an indispensable association of interests. The founders of the American Street Railway Association were H. H. Littell, Walter A. Jones, Thomas Lowry, Henry M. Watson and J. E. Rugg.

It must be understood that in these early times the horse car was a most common institution and street railways operated by either cable or electricity were undertakings of a most questionable character. It seems that the founders of the original organization circulated read-



T. C. Penington, Secretary, A. S .R. A.

ing matter among the street railway companies of Canada and the United States which requested their aid in "the promotion and advancement of knowledge, scientifiic and practical, in all matters relating to the construction, equipment and management of street railways; the establishment and maintenance of a spirit of fraternity among the members of the association by social intercourse and friendly exchange of information and ideas to the end that the best service may be obtained at the least possible cost." It seems that the first president was H. H. Littell and the first meeting was called to order by the Hon. Moody Merrill. The characters associated with the early growth and development of this interesting association have been largely scattered, some of them have been gathered unto their fathers; those that are left and who view the trend of events must marvel at the astonishing growth of the street railway interests. In previous issues of The Electrical Age subject matter relating to the meeting and facts regarding transportation and the papers to be read has been published.

It might be historically interesting to such as scan these pages to have a resume of the past meetings of the American Street Railway Association which were held at the following places and at the following times: First convention, Boston, 1882; second meeting, Chicago, 1883, president, H. H. Littell; third meeting, New York, 1884, president, Hazzard; fourth meeting St. Louis, 1885, president, Richards; fifth meeting, Cincinnati, 1886, president, Walsh; sixth meeting, Philadelphia, 1887, president, Ackley; seventh meeting, Washington, 1888, president, C. B. Holmes; eighth meeting, Minneapolis, 1889, president, Kerper; ninth meeting, Buffalo, 1890, president, Thomas Lowry; tenth meeting, Pittsburgh, 1891, president, Henry M. Watson; eleventh meeting, Cleveland, 1892, president, John G. Holmes; twelfth meeting, Milwaukee, 1893, president, D. F. Longstreet; thirteenth meeting, Atlanta, 1894, president, Henry C. Payne; fourteenth meeting, Montreal, 1895, president, Joel Hurt; fifteenth meeting, St. Louis, 1896, president H. M. Littell; sixteenth meeting, Niagara Falls, 1897, president, McCulloch; seventeenth meeting, Boston, 1898, president, Lang; eighteenth meeting, Chicago, 1899, president, Sergeant.

We republish the following from our last issue: Papers will be read on the following subjects:

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions."

"Comparisons of the Various Systems of Electrical Distribution for Street Railways."

"Consolidation of Street Railways and Its Effect Upon the Public."

"The Store Room and Store Room Accounts."

"Painting, Repainting and Maintenance of Car Bodies."

Friday, October 19, has been set apart as a day for the examination of the exhibits. No session of the Association will be held, so that all may have plenty of time to view the exhibits. It is earnestly requested that managers have their heads of departments present on that day.

The annual banquet will be held at the Coates House Friday evening, when the officers-elect will be installed.

The headquarters of the Association will be at the Midland Hotel.

Educational.

EVENING SCHOOL OF ELECTRICITY.

The evening school of electricity under the direction of the Harlem Branch of the Young Men's Christian Association, at No. 5 West 125th street, will open for its third season during the first week in October. The school will be in charge of Mr. S. A. Small, assistant instructor in electricity at Columbia University, and a man who is thoroughly practical from every standpoint, having seen active service in every branch of electrical work. The sessions will be held on Tuesday and Friday evenings and the course will consist of forty-eight lectures. Mr. Small will commence by thoroughly grounding the class in the fundamental rules and principals of electrical engineering, and during the course will cover fully the various branches of telegraphy, telephony, police and fire alarm telegraphy, arc lighting, alternating current apparatus, the distribution of electric power, the electric street railway, the electric automobile, the "X" rays and wireless telegraphy. The lectures will be illustrated by diagrams thrown upon the screen by means of a powerful stereopticon, and in addition to this a large amount of apparatus will be used in illustrating the work. The opening session on October 2d will be free to all men, and visitors are cordially invited.

The Incandescent Lamp.

INCANDESCENT LAMPS.*

BY FRANCIS W. WILLCOX.

(Concluded from page 111.)

Compare this with Fig. 9, showing results on ten lamps taken at random from a barrel sold for 16 candle-power 3.1 watts per candle, an excellent example of poor results.

A proper measure for lamp value should include both life and candle-power results. Such a measure is the candle hours of life given by a lamp to an agreed limit of candle-power. The limit agreed upon is 80 per cent. of initial candle-power. The graphic expression of this measure is the area bounded by the average candle-power curve and a vertical line drawn from intersection of curve and 80 per cent. limiting line. This area is shown on diagram, Fig. 10, and is called the candle hour area.

The part of this area below the 80 per cent. line forms a constant quantity, and it would be better were this omitted and only the area above the 80 per cent. line, or "top area" as it is called, taken. It is this "top area" which measures the useful results, and much more determinate comparisons can be made on it as a basis of value than on the full area.

It is pertinent to also note that with normal lamps the candle hour area is directly proportional to the useful life, so that the useful life can be used as a definite basis for specifications and guarantees.

As regards candle-power performance, customers should purchase their lamps under specifications requiring a minimum number of candle hours or a minimum useful life as the average results for the principal types of lamps used and exacting a penalty of a sufficient number of lamps or the money value thereof to make up any deficiency between guarantees and actual performance, as determined by tests of samples taken from each lot of lamps.

Regarding specifications in general there is much that is objectionable in their practical application to lamp purchase and supply. The incompetent manufacturer will quite glibly bid under any set of specifications either through ignorance of what he can do or trusting to luck to get around the requirements. He can hardly be blamed for running the chances, considering how seldom complete checking tests are made of lamps purchased. Let a consistent invariable course be followed of testing lamps before they are accepted for use and of rejecting every lot that falls below requirements, and the incompetent manufacturer will soon be brought to table. This has been the policy of the U. S. Navy, and it is a well known fact that numbers of manufacturers have learned to their cost that they dare not bid to supply lamps to the navy.

The navy keeps a sufficient stock on hand to supply running needs and tide them over the delay due to the rejection of any lot purchased.

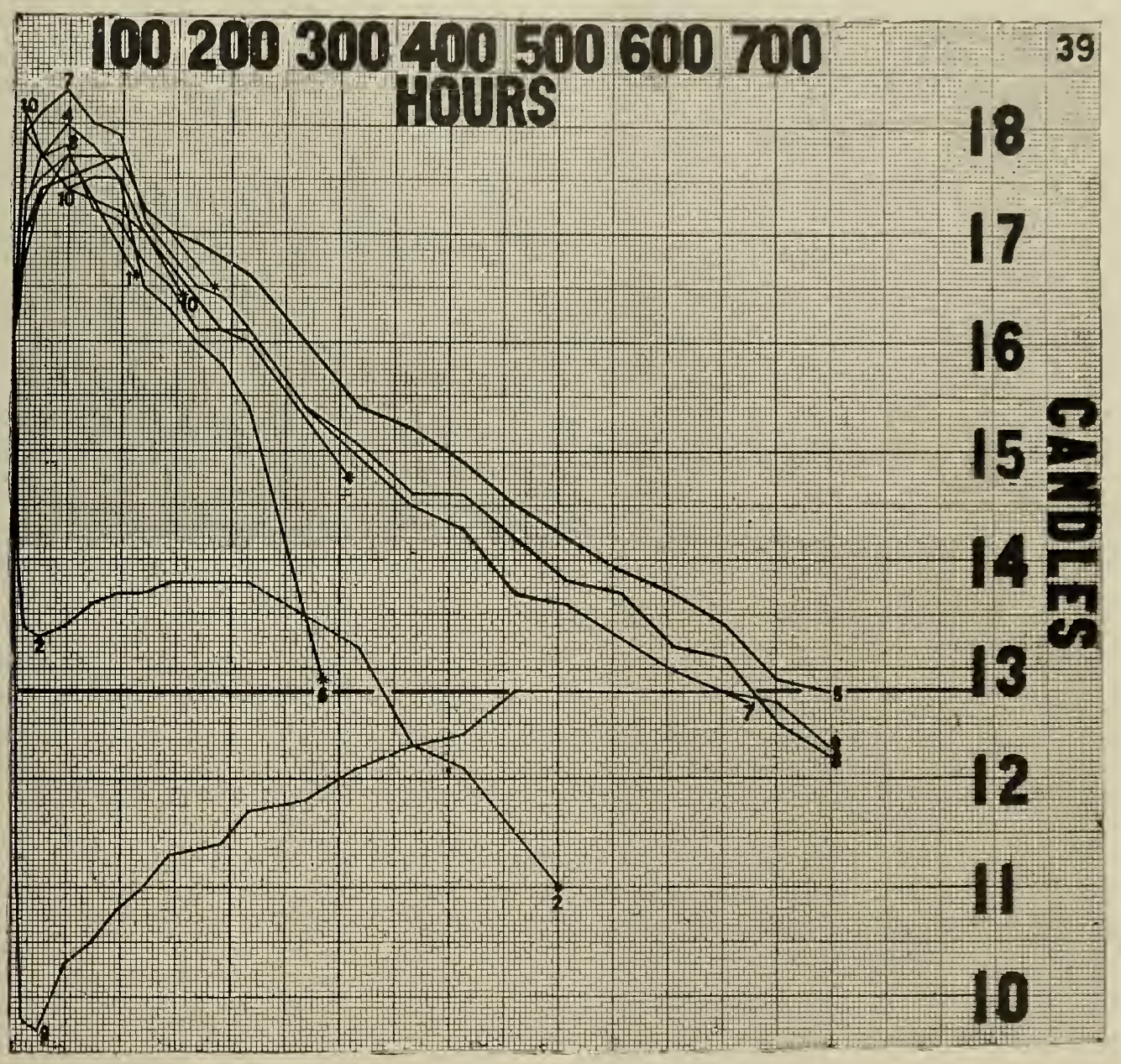


Fig. 7.—Candle-power performance of ten lamps, 16 candle-power 112 volt 3½-watt lamps, showing lack of uniformity in performance.

*Read before the Franklin Institute.

These conditions are, however, not to be found in the case of the average purchaser, and other methods are necessary. The best and most practical method, it seems to me, was the one adopted by the Standard Oil Company, of New York. This company last winter purchased in the open market some fifty lamps each of a dozen of the leading makes and carried out a complete test thereon. This gave them positive data as to what lamp gave best results, and the difference in value between it and the next best. With this information in hand the selection of the lamp to be purchased was readily and intelligently made.

This suggests the best plan for the general purchaser. Let him determine, by test of the average product of different makers, the best make and type of lamp suitable for his service. Then let him buy the lamp thus selected, under specifications and guarantees, testing samples from each lot of lamps received, and holding the manufacturer closely to his guarantees.

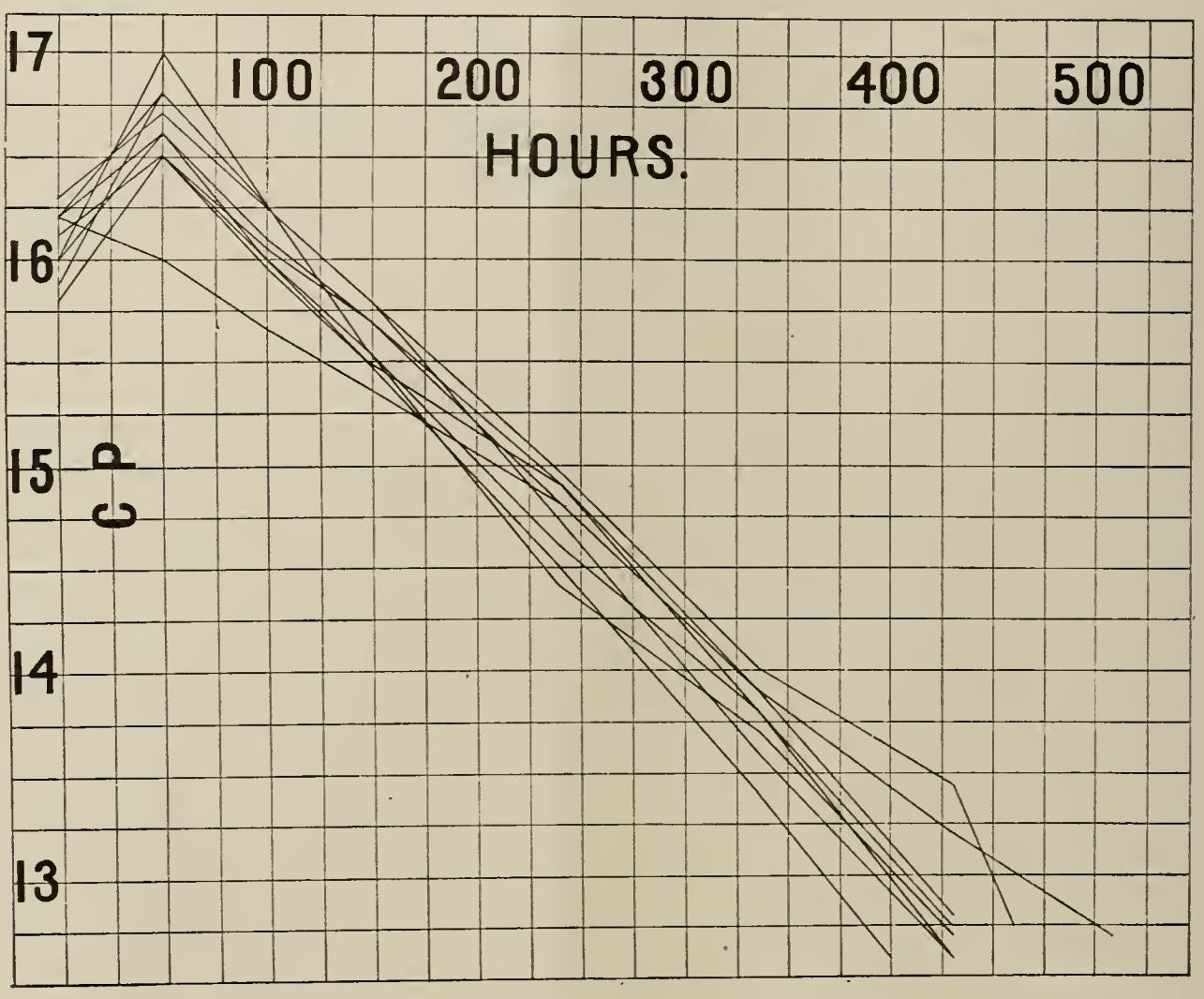


Fig. 8.—Candle-power performance of ten 16 candle-power 112 volt 3.1 watt lamps, showing uniform and good results of well-made lamps.

High Voltage Transmission.

ELECTRIC CABLES FOR HIGH TENSIONS.

There has been a marked tendency in recent years towards the localization of the central stations of electric light and traction companies at points adjacent to the water side, or the railways, especially the former, where fuel may be delivered by suitable coal conveying apparatus from vessels to the station coal bins, and where water may be cheaply obtained for condensing, and also where generators of large and uniform units, capable of being operated at most efficient loads, may be employed. The cost of coal hauling alone will be appreciated when it is considered that some of the large new power houses in the city of New York will ultimately use approximately 175,000 tons of coal per annum.

In addition to these sources of economies there are also to be considered the concentration of executive and operating forces in one building, and the realizing of valuable real estate in the busy and crowded sections of cities. In the old portion of New York city alone, south of the Harlem river, when the plans now in process of execution shall have been completed, the output of eight power stations, situated at different points, will be generated and transmitted from one large central station on the East river. The large electric traction companies of Manhattan will also soon have their power houses at one or two points on the river side, where a plant capable of generating about 60,000 kilowatts, or about 80,000 horsepower, is now being completed.

The centralization of such power stations is made commercially practicable by the transmission at a high electrical pressure of the electrical energy generated at the central stations to the points of distribution,—it may be three, five, or ten miles distant,—the pressures ranging in New York city from 6,600 to about 8,000 volts. This electrical energy is successfully transmitted through cables in the underground electric subways, and on many of the circuits electrical energy to the amount of from 1,000 to 2,000 kilowatts (say, 1,340 to 2,680 mechanical horse-power) is thus transmitted.

The highest working pressure for underground cables thus far proposed is that soon to be operated by a Western company in the United States. This company has an electric plant, driven by water-power, from which the current is to be transmitted at a pressure of 25,000 volts, on overhead wires, a distance of about twenty miles to the city limts. From this point to the point of distribution in the city the power is to be transmitted through underground cables, at the same pressure, a distance of three miles.

Inasmuch as some authorities consider that 40,000

volts represent the maximum electrical pressure that can be advantageously employed on overhead lines for the transmission of electrical energy on a large scale, it is thought that the safe maximum pressure for underground cables has, perhaps, been reached, if not exceeded, in the installation referred to, owing to the difficulties to be encountered in maintaining the insulation at such high pressures. The operation of this circuit will be watched with much interest, and doubtless by its success or failure the pressure of subsequent installations of a like nature will be measurably gauged.—Cassier's Magazine.

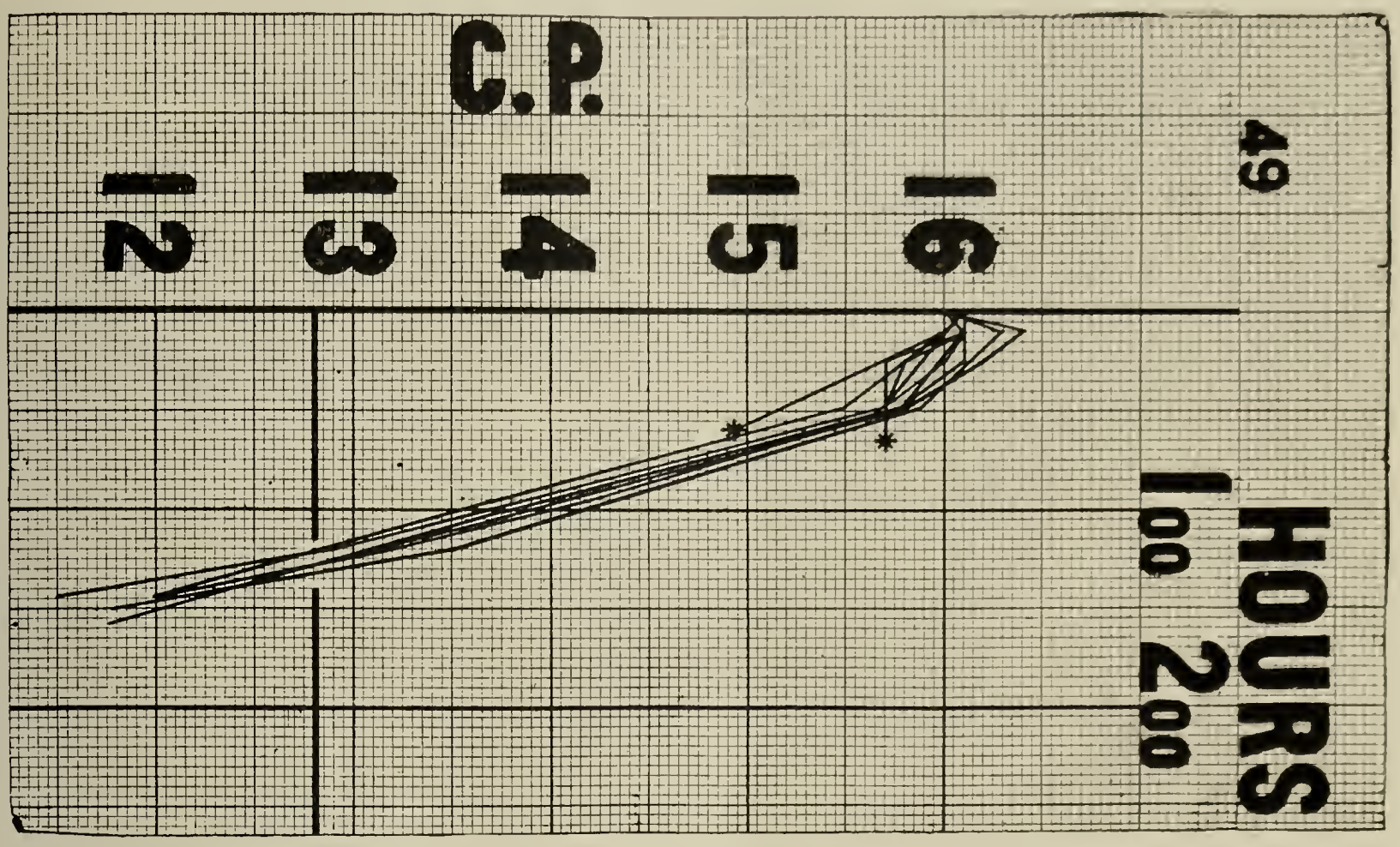


Fig. 9.—Candle-power performance of ten 16 candle-power 511-volt 3-1-watt lamps, showing rapid decline of candle-power.

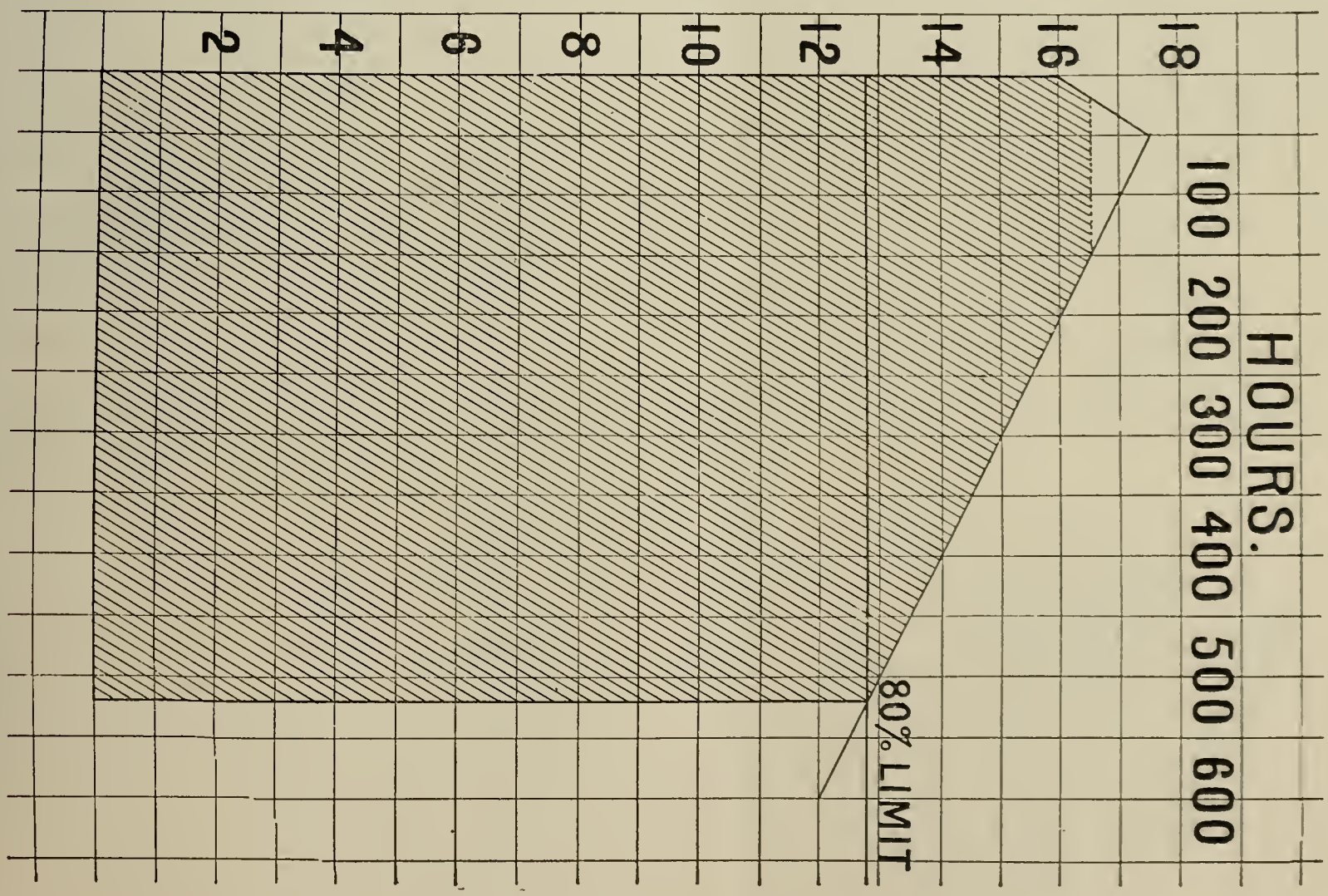


Fig. 10.—The candle hour area. The measure of lamp value.

Obituary.

J. E. HUDSON.

John E. Hudson, president of the American Bell Telephone Company, died suddenly in the Boston & Maine Railroad station in Beverley Farms, Mass., on October 1, while waiting for a train.

Mr. Hudson was born in Lynn, Mass., on April 3, 1839, and had been connected with the Bell Telephone Company since 1880, when he became counsel. In 1885 he succeeded T. M. Vail as general manager and four years later he became president, succeeding Howard Stockton.

Mr. Hudson was a graduate of Harvard, class of '62, and was considered one of the best Greek scholars in the United States.

Book Reviews.

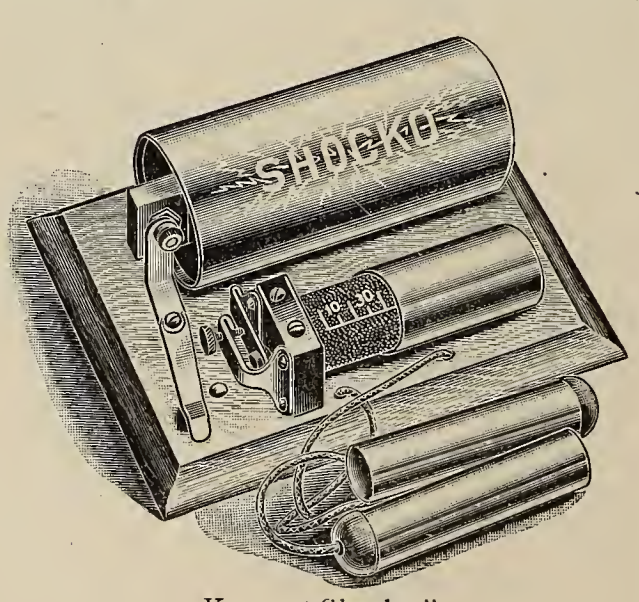
"ELECTRIC LIGHT HOME."

Mr. James H. Mason, well known to the trade for many years as an inventor and builder of electrical machinery, has brought out a new edition of his work, entitled "Electric Light Home," a practical treatise about electricity, understandingly written for everybody. This little volume is written clearly and concisely, containing the subject matter that could only be reached in more pretentious works by wading through a mass of uninteresting technical literature. Practical direction are given in "Electric Light Home" for building and operating small electric light plants fed by primary batteries. The details to be known in connection with the practical care of a battery and simple rules governing connections and for the calculation of electro-motive-force, resistance and current are simply stated. This book will be exceedingly useful to the amateur with an eye to Christmas decorations and the amateur electrician who desires to begin a practical course in electrical engineering. The book contains a list of supplies and where they may be best obtained in addition to a host of interesting facts of value to everyone. It consists of 32 pages with illustrations and will be mailed by the author to any address upon receipt of ten cents. Mr. Mason's address is 170-172 West Broadway, New York city.

Electrical Novelties.

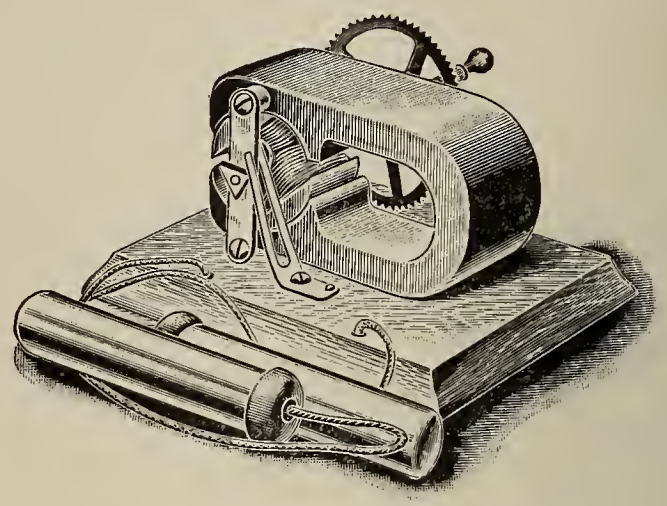
KNAPP'S NOVELTIES.

The Knapp Electric & Novelty Company, of 125 White street, New York city, have coralled the business of electric toys so successfully that every store supplying



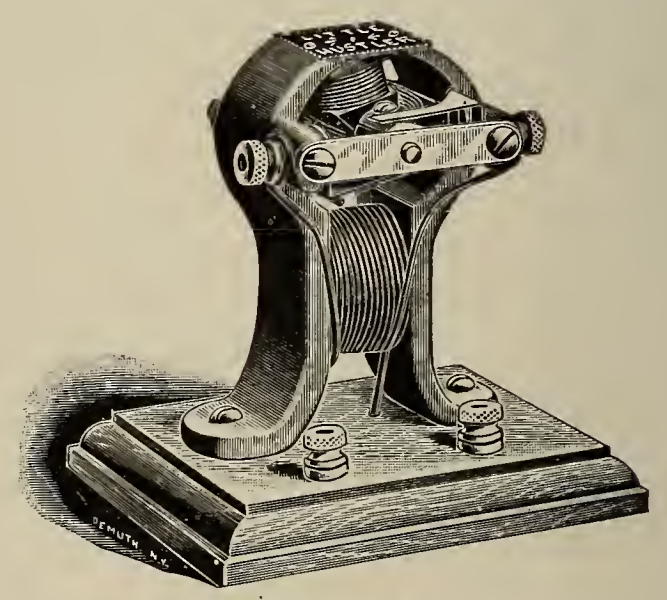
Knapp "Shocko."

this class of goods will be found with a line of Knapp's toys in the windows. They comprise a long list such as the "Little Hustler" motor, Knapp's "Shocko" medical battery, Knapp's "Electric Thriller," a unique and interesting electric toy called Knapp's "Electric Questioner," a complete fan motor outfit and an automobile, the first of its kind for children's use. In the illustrations are shown the "Little Hustler" motor, which is really a first class mechanical and electrical device. It will start the



Knapp Electric Thriller.

instant the circuit is closed, will run with the current of one dry cell and will drive a five inch fan at a high rate of speed. The "Shocko" medical battery is a complete and perfect medical coil with regulating device, a pair of handles, a switch and battery, vibrator, silver contact points, and, in fact, everything required to make it a pronounced success. It only cost a dollar and is worth many times that amount. The Knapp "Electric Thril-



Little Hustler Motor.

ler" is a shocking machine of a magneto type. It is practically a small dynamo and costs no more than the "Shocko." A circle of friends will get many an evening's amusement out of the "Electric Thriller." Catalogues will be mailed to all interested applicants by writing to the above address.

THOMAS A. EDISON TO BE SUED BY THE NATIONAL PHONOGRAPH ASSOCIATION.

At the recent meeting of the National Phonograph Association, held at Cincinnati, thirty-two phonograph companies of the United States being represented, steps were taken to begin suit enjoining Thomas A. Edison from further alleged breaches of contract in selling to others territorial rights which they assert he sold to them in 1888, and which contracts do not expire, they claim, until 1903. Suits for damages against Mr. Edison and for an accounting of the machines and territory so disposed of were also arranged for. The following officers were elected: President, A. W. Clancey, Chicago; vice-president, B. C. Kinead, Louisville; secretary, J. L. Andem, Cincinnati; treasurer, E. D. Easton, Washington.

Electric Light and Power.

TRANSITION TO ELECTRIC POWER.

With electrical distribution of water power only a small space is necessary for the few large wheels and dynamos that absorb the entire energy of the water. Mill sites, instead of being confined to a little land along the banks of a river or canal, at once expand to include the territory within five, ten or a greater number of miles of the generating plant. This expansion of service area affects the number and the character of power users. The number of industries is limited only by the water available, and the capacity of each may be either great or small. Since mill sites have come to include all the land within a long radius that is not required for other purposes, the opportunity to buy cheap power has only a slight influence on rents. Almost the entire saving in the cost of power is thus to be divided between the water company and its patrons.

A distinct feature of electrically distributed water-power is the advantages it offers to manufacturers of small and medium capacity. The consumer of 100 horse-power will probably have to pay somewhat more per unit than the consumer of 1,000 horse-power, but the difference in rates will represent only a small fraction of that in cost which would result were a separate water-wheel installed for each case.

It is interesting to note that the results with electrically distributed water-power are different from what some have expected. Electric energy, it was claimed, for example, would go great distances to the factories; as a fact, however, the factories have gone great distances to the electric power. Location and other advantages being equal, it is found more economical to move an industry once than to move a large amount of energy to it over a great distance daily. Increase of transmission voltages may reduce, but it cannot eliminate the costs and losses of electric conductors. For very long transmissions the fixed capital in conductors, pole lines, and the extra machinery necessary for the several transformations bears interest, per delivered unit of energy, that might well cover the entire charge for such unit near the generating plant. In the future, as at present, long-distance transmission of electric power must be the exception for special cases, and transition, to within a few miles at most of cheap sources of energy, the rule for the great majority of industries served.—Cassier's Magazine.

Stray Currents.

MOTOR BOATS ON THE DEAD SEA.

The Dead Sea, which for thousands of years has been a forsaken solitude in the midst of a desert, on whose waves no rudder has been seen for centuries, is to have a line of motor boats in the future. Owing to the continued increase in traffic and the influx of tourists, a shorter route is to be found between Jerusalem and Kerak, the ancient capital of the Land of Moab.

The first little steamer, built at one of the Hamburg docks, is about 100 feet long, and began the voyage to Palestine on June 16. An order has already been given for the building of a second steamer. The one already built and on the way is named Prodromos (that is, "forerunner"). It will carry thirty-four persons, together with freight of all kinds. The promoters of this new enterprise are the inmates of a Greek cloister in Jerusalem. The management of the line is entirely in German hands.

ELECTRICAL DECOMPOSITION OF COPPER.

The old method of obtaining deposits of copper by electric decomposition of its solutions has been steadily gaining ground, and it is estimated that the pure copper produced in this way now amounts to 500 tons daily. An early difficulty was the slowness of the process, a weak current being necessary to ensure a smooth and adhering deposit. Various devices have made it practicable to work with more powerful currents, and in a given period several times as much copper may be deposited as was obtained from a similar bath ten years ago. One means of overcoming the tendency of the rapidly-made deposit to become granular was the continuous passing of an agate burnisher over its surface. An oiled sheepskin was then used as a burnisher, and by the new plan of Sherard Cowper-Coles the copper is deposited on a rapidly rotating vertical mandril, the centrifugal force and the wash of the electrolyte keeping the surface clean and free from gas and ensuring a smooth and dense deposit.

EFFECT OF ELECTRIFICATION.

Electrification is likely to become an important condition in the classification of climates, with warmth and cold, moisture and dryness. This is the view of Dr. Schliep, of Baden-Baden, who finds that the atmosphere is usually positively electrified, but that there are a few days in every month when negative electrification can be observed, and rare occasions when scarcely any electrification can be detected. The influence of the variations on comfort and even health seems to be very marked. Negative electrification is tiring; positive is exciting, and stimulates the circulation and the nervous system. Strong electrification may produce nervous disorders and even inflammation of the respiratory organs—this being too much of a good thing. Negative electrification, on the other hand, brings depression and its attendant disorders, and is likely to be a season when milk sours, meat spoils, and bad smells come from the gutters. The growth of plants and germs is favored, the soil itself being negatively electrified at all times.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.

PATENTS ISSUED SEPTEMBER 25, 1900.

Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

658,336. Electric railway. E. M. Bentley, New York, N. Y.

658,388. Mechanism for imparting successive or alternating movements. E. Moore, Meductic, Canada.

658,423. Carbon rod for electric arc lamps. H. Bremer, Neheim, Germany.

658,431. Dynamo-brush. C. Endruweit, Berlin, Germany.

658,476. Dynamo regulation. I. E. Story, Trenton, N. J.

658,483. Process of oxidizing negative electrodes for primary batteries. C. J. Coleman, Chicago, Ill.

658,541. Bond tie for electric railways. W. A. Downing, Pittsburgh, Pa.

658,601. Appliance for imparting heat and electricity to the body. I. Timar, Berlin, Germany.

658,607. Projecting apparatus. F. J. Adams, New York, N. Y.

658,664. Thermostat. W. E. Mack, Oswego, N. Y.

658,698. Electric furnace. C. S. Bradley, New York, N. Y.

658,706. Electric stove. H. J. Dowsing, London, England.
658,733. Secondary battery. C. J. Coleman, Chicago, Ill.
658,734. Secondary battery. C. J. Coleman, Chicago, Ill.
658,739. Coin setting electric meter. F. Kraemer, Chicago, Ill.
658,741. Electric welding machine. O. Parpart, Cleveland, Ohio.

ISSUED OCTOBER 2, 1900.

658,753. Rail-bond. S. W. Blanchard, Seattle, Wash.
658,815. Method of producing phase displacement. Wm. Hanley, Great Barrington, Mass.
658,862. Telegraphaphone. E. C. Paramore, Philadelphia, Pa.
658,865. Secondary battery. H. C. Porter, Chicago.
658,891. Electrode and electrode connection. Henry Carmichael, Malden, Mass.
659,061. Electric lamp. F. L. Fowler, Philadelphia, Pa.
659,096. Telephone line. L. C. Paramore, Philadelphia, Pa.

Business News.

NEW INCORPORATIONS.

Pierre, S. D.—Articles of incorporation have been filed for the New Hampshire Lighting Company, at Pierre, with a capital of $200,000; incorporators: Don L. Clark, G. V. Pattison and Charles C. Corbett.

Broadalbin, N. Y.—Broadalbin Electric Company, to furnish light, heat and power for the village of Broadalbin. Capital, $25,000; directors: Henry B. Dakman, E. H. Tucker and T. Arthur Farley, Brooklyn; L. U. Shafter, Rockville Centre, L. I.; Charles F. Lehmann, Smithtown, L. I.

Syracuse, N. Y.—The Archbold-Brady Company, of Syracuse, has been incorporated to construct street surface railroads, electric lighting plants, telephone, telegraph and gas plants. Capital, $50,000; directors: William K. Archbold, Paul T Brady and Robert E. Drake, of Syracuse.

TELEPHONE CALLS.

Wilmington, Del.—The New York, Philadelphia & Norfolk Telegraph and Telephone Company, of Wilmington, Del., has been incorporated; capital, $150,000.

Farmland, Ind.—The Farmland Telephone Company, of Farmland, has been incorporated to operate telephone lines. Capital, $10,000; incorporators: T. W. Botkin, W. C. West, H. D. Good, J. T. Wright, J. Nixon, all of Farmland.

Warsaw, Ind.—The Commercial Telephone Company, of Warsaw, has been chartered to build lines and operate exchange. Capital, $30,000; incorporators: J. A. Widaman, O. Oldfather, C. M. Burkett, S. W. Chipman, C. E. Wahl, M. R. Williams, all of Warsaw.

STREET RAILWAY NEWS.

Reading, Pa.—A charter has been issued by the State Department at Harrisburg to the Oley Valley Railroad Company, to build a line from Reading to Boyertown. Capital, $200,000. John A. Rigg, of Reading, is president. The new line will be affiliated with the United Power and Transportation Company, which owns the lines in Reading.

Cincinnati, O.—The Ripley Northern Railway, of Ripley, Brown County, Ohio, has been incorporated by: Ernst Bambach, E. E. Galbraith, John W. Adkins, G. R. Young, J. C. Newcomb, Albert White, P. D. Newcomb, J. S. Alward and J. E. Kirkpatrick. They propose to build an electric railway from Ripley to Hillsboro, a distance of about 30 miles.

Cincinnati, O.—The Columbus, Mt. Sterling & Washington, Ohio, Electric Railway Company was incorporated recently. The line will extend from Washington Court House through Bloomingburg, Madison Mills, Cooks and Mt. Sterling to Columbus, a distance of 40 miles. The enterprise is backed by James M. Wilson, of Chicago, and other Columbus capitalists.

DIVIDENDS.

Schenectady, N. Y.—The General Electric Company has declared a dividend of two per cent. on common stock, an advance of one-half per cent. from the last previous payment. The dividend is payable October 15 to stockholders of record September 25.

BUSINESS TROUBLES.

New York City.—Justice Truax has granted an order dissolving the firm of the Schmidt & Bruckner Electric Company, of 135 Elm street, and appointed Lambert Schmidt permanent receiver. Mr. Schmidt was appointed temporary receiver on June 5 in a suit brought by Frederick C. Bruckner against Lambert Schmidt for a dissolution of the co-partnership on account of a disagreement between them.

MANHATTAN ELECTRICAL SUPPLY CO.

The Manhattan Electrical Supply Company have purchased the firm of Huebel & Manger, of Brooklyn, N. Y., all of their patents, trade marks, business, manufacturing plant and stock. Messrs. Huebel & Manger will in the future have charge of their extensive manufacturing plant in Jersey City. The complete lines of electrical supplies heretofore manufactured by Huebel & Manger will be continued, and many articles will be added to the long list, which the Manhattan Electrical Supply Company are now manufacturing. This change in business will add about one hundred employes to the pay roll of the Manhattan Electrical Supply Company, which at the present time carries about $3,000 weekly salaries at their factory. The Manhattan Electrical Supply Company own ten city lots on Morris and Essex Streets in Jersey City, and arrangements have been made for additional buildings. The Manhattan Electrical Supply Company occupy the entire building at 32 Cortlandt street, New York, where they wholesale and retail the products of their factory. This concern started in business twelve years ago with capital of less than $1,000, and up to the present time no money has been invested excepting the profits, which have been reinvested in the business. The present capital stock of the company is $1,000,000.



WESTON STANDARD

PORTABLE DIRECT READING

VOLTMETERS

AND

WATTMETERS

For Alternating and Direct Current Circuits.

The only standard portable instrument of the type deserving this name.

Write for our Catalogue of Portable Instruments.

WESTON ELECTRICAL INSTRUMENT CO.,

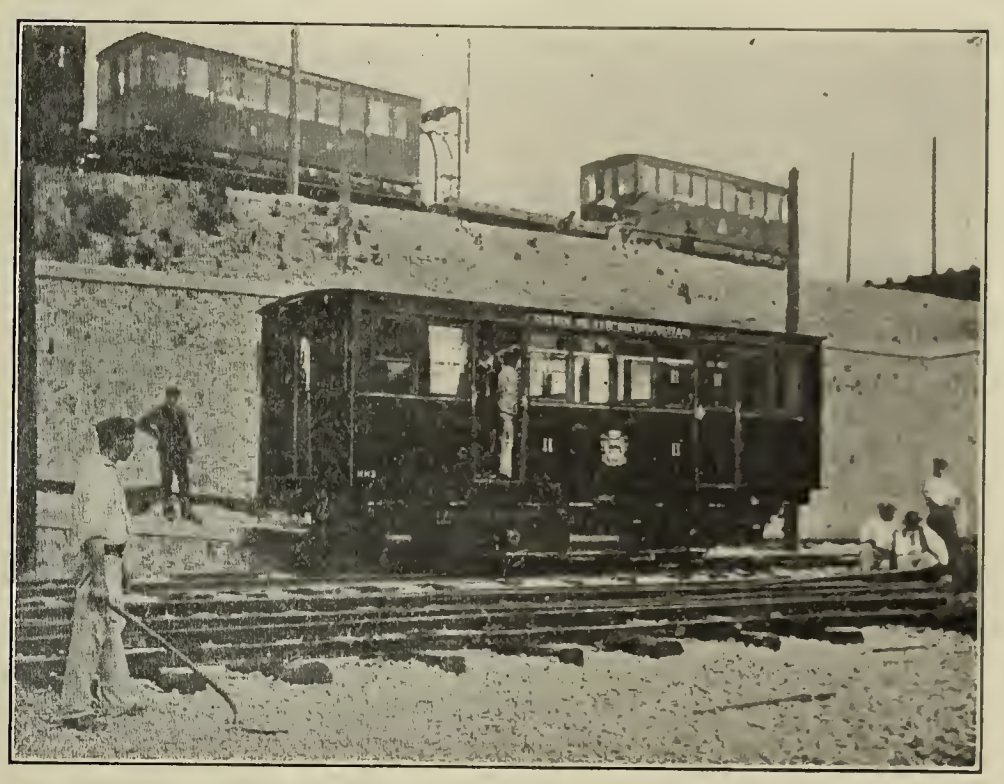
114-120 William Street, Newark, N. J.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 16. NEW YORK, OCTOBER 20, 1900. Whole No. 701.

Electric Railways.



View of Carriage.



Station at the Champs Elysees.

THE METROPOLITAN RAILWAY, PARIS.*

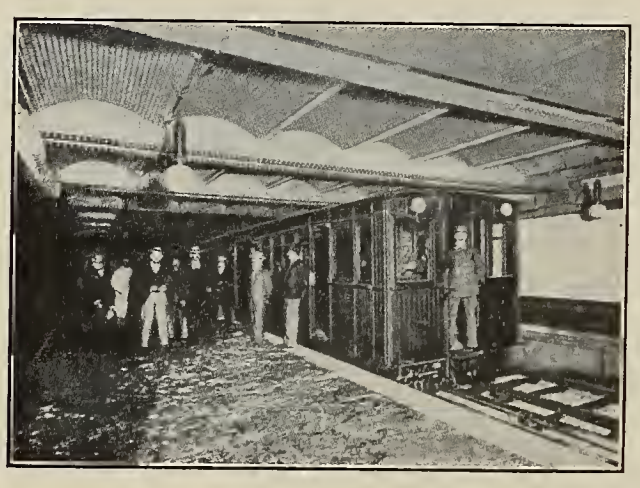
The history of the scheme, which has been proposed at various times during the past 45 years, for a convenient suburban traction service in Paris, is very interesting. It shows perfectly what wonderful effects and what changes in ideas have been the result of successful electrical traction. There were constant discussions and dissensions as to whether an overhead or an underground system should be adopted. In the early days when steam driving was the only means at hand to serve the purpose, the advocates of the overhead line were in

*From the "Electrical Review," London.

the majority; naturally they did not wish to travel in underground tunnels, where smoke, steam and other foul vapors were present.

Of late years, however, the advocates of an underground system for Paris have been in the majority, since the objections just mentioned have been entirely removed by the successful introduction of electrical traction.

Eventually it was decided to install an underground system of electrical traction. When completed there will be about twenty-six miles of track of which 8 3-4



Lyon Station.

miles were opened to the public and commenced operation on July 19th of this year. The part in operation consists of about 6 miles length between La Porte de Vincennes and Porte Maillot, and two short branches, viz., from Porte Dauphine to Place de l'Etoile and from the Trocadero to Place de l'Etoile.

The whole of the line is double tracked, with the exception of some very short single track loops at junctions and at terminal stations.

The subterranean tunnel of the double track has an elliptic vault about 23 feet wide, 7 feet high and 1.7 feet thick; the vertical sides are 2.5 feet thick and 9.5 feet high; the floor is of the shape of a reversed vault, and is 1.5 feet thick, the deepest point of floor surface being 2.3 feet below the rail head.

The interior of the tunnel is lined with a thickness of 0.76 inch of Wassy cement on the vault, and a similar coating of Portland cement lines the walls and the floor.

On curves with a radius of less than 328 feet, the width of the tunnel is increased. With curves of 300 feet radius, the width of the tunnel is 24 feet; with curves of 100 feet radius, the width is 25 feet approximately.

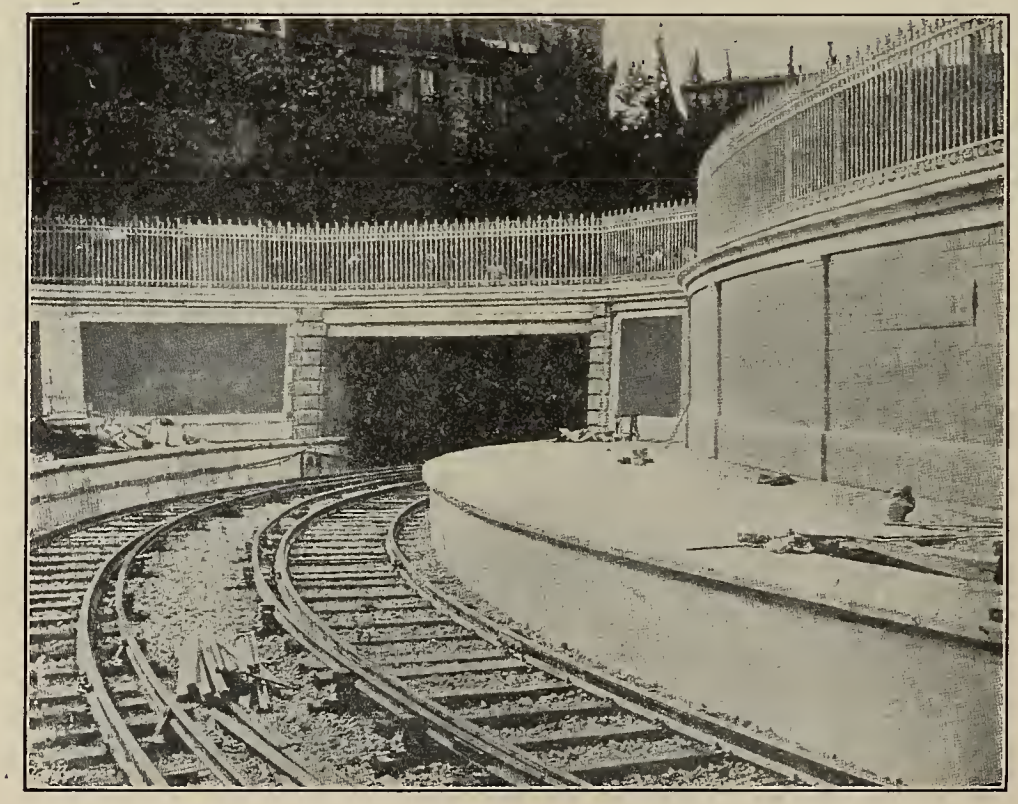
The single track tunnel has a vault of semi-circular shape of about 7 feet radius and 1.5 feet thick. The height of the side walls is 8.3 feet, and their thickness is nearly 2 feet; the sides are 14 feet apart at the floor, which is slightly convex, and has a thickness varying from 1.55 feet at the center to slightly less at the sides. This tunnel at the curves of less than 100 feet is constructed rather wider at the base.

The rail track is laid on cross sleepers of creosoted wood, spaced about 3 feet apart in ballast varying in depth from about 2 feet to 0.6 feet.

The track gauge is 4.4 feet, and the rails are of the Vignoles type, 100 lbs. per yard, in lengths of about 50 feet. The rails rest on flat plates or chairs, the lengths being joined by four-hole fish-plates about 2 feet long.

The track is electrically equipped on the third-rail system, with track rail returns. The main rail is supported on porcelain insulators, set on extensions of every second or third track rail sleeper, according to the position of the rail joints. The conducting rail is similar to the track rails, and all joints are bonded with four copper bonds.

The stations on the parts which are in actual operation are 25 in number. The line from La Porte de Vincennes to Porte Maillot has 18 stations, the branch line from Place de l'Etoile to Porte Dauphine has three, and the branch from Place de l'Etoile to the Trocadero has four stations. This includes as separate stations the three distinct parts at Place de l'Etoile.



The Only Open Air Station, Place de la Bastille.

Of these stations, 17 have a vaulted roof, and are of similar construction to the tunnels, with an additional lining of glazed tiles and bricks.

Seven stations have steel girder roofs, with intermediate masonry arches, and one station alone, the Place de la Bastille, is open to the sky.

The passenger platforms are 13 feet wide, and rather more than 3 feet high above the rail-head; by this ar-

rangement passengers step down about 5 inches into the railway train when embarking. Staircases lead from the street pavements down to the station platforms. Both the trains and the tunnels are electrically lighted; he stations with vaulted roofs are lighted by incandescent lamps, spaced about 13 feet apart, and those with the steel girder roofs are lighted by arc lamps.

The rolling stock consists of trains made up one locomotive and two trailers. There are 46 locomotives or motor carriages; of these 34 are provided with a controller at one end only, and 12 have a controller at each end. The horseshoe arrangement of the track at each terminus obviates the necessity of running the trains in both directions, and turntables are provided should it become necessary to turn the locomotive.

Each locomotive is equipped with two motors. They are of 120 hp. each, four-pole, and are entirely iron-clad. The pole-pieces are of soft steel laminations, cast into the iron sheathing or shell.

These motors were supplied under very stringent conditions as to their reliability and capacity for work under considerable overloads for long lengths of time. They were first put under the actual tests stipulated and in every case came up to their guarantee perfectly. They stood an overload for some time of 100 per cent., a pressure of 3,000 volts alternating current on their coils, and a pressure of 500 volts between adjacent commutator bars. The motors run on a 500-volt circuit when operating the railway.

The motors drive through a single reduction spur gearing, having the ratio as 1:2. The cables and mains, car lighting, automatic cut-outs, fuses, and in fact the whole of the electrical equipment of the rolling stock and track is Westinghouse, including the series-parallel controllers, which are of the well-known magnetic blow-out type. The total weight of a train, one locomotive and two trailers, with their full complement of passengers, is about 70,000 lbs.

The generating station is situated at Bercy on the Quai de la Rapee.

The boilers are of the semi-tubular type, and are arranged in three groups of six each. The two engines are of 2,600 hp. each, and run at 70 revolutions per minute. They are direct coupled to the generators, of which there are both alternate and direct current sets. The alternate current dynamo is three-phase, and yields an output of 1,500 kw. at 5,000 volts pressure, and at a frequency of 25 per second. The direct current machine yields 1,500 kw. at a pressure of 600 volts. There is, of course, a full equipment of exciters, boosters, converters, switching devices, and also a storage battery. The three-phase current is supplied to a converter sub-station at Place de l'Etoile, and is changed to direct current at 600 volts to feed that part of the line. This sub-station is very fully equipped, and contains the following apparatus:—Nine transformers of 250 kw. each changing the three-phase current pressure from 5,000 volts to 360 volts, three converters of 750 kw. each, a battery of accumulators of 1,800 ampere hours' capacity, two boosters of 250 kw., and switchboard arrangements. Two sets of three-phase feeders enter this station and three direct current feeders leave it.

Th fares charged on this line are 25 centimes for first class, and 15 centimes for second class passengers, whatever the distance traveled may be.

The trains are now in full operation. The comfort of traveling, and the speedy means of getting from one part of the city to another without bother, crush or hurry on the part of the passengers has already made the line immensely popular, and ensured a prosperous future for this railway, for which Paris has waited so long.

Automobiles.

THE MADISON SQUARE GARDEN AUTOMOBILE SHOW.

It is the intention of the Automobile Club of America to make the first annual show under its auspices, to be held at Madison Square Garden during the week of November 3d to 10th, an event which will lead up to that greatest of New York's functions, the Horse Show, and, for a new enterprise, fully as great and important as any held by the National Horse Show Association. Every style and kind of horseless vehicle will be shown and the Garden will be so arranged that they will be shown to motion. An opportunity will be given to visitors to examine automobiles in detail and to see them moving at a high rate of speed immediately under their eyes. They will also have an opportunity of riding in any kind of vehicle they prefer, either in the Garden or on the streets, thus giving them a practical test of the value of the new carriage. Several makers of prominence in this country and also foreign manufacturers will be represented by an infinite variety of carriages. That the show is complete may be seen from the fact that the demand for space by exhibitors was so great that the restaurant had to be used and even this additional space has been found unequal to the demand. The following list of exhibitors includes the very best concerns in this industry:

The National Automobile and Electric Co., Riker Motor Vehicle Co., The Winton Motor Carriage Co., Barker Motor Vehicle Co., De Dion-Bouton Motorette Co., The Autocar Co., Foster Automobile Mfg. Co., Automobile Company of America, Woods Motor Vehicle Co., Stanley Mfg. Co., Locomobile Co. of America, Canda Mfg. Co., American Electric Vehicle Co., Daimler Mfg. Co., Waltham Mfg. Co., American Bicycle Co., Electric Vehicle Co., Holyoke Automobile Co., Knox Automobile Co., Overman Automobile Co., International Motor Carriage Co., New York Motor Vehicle Co., Trinity Cycle Mfg. Co., John T. Robinson & Co., Steam Vehicle Co., Peerless Mfg. Co., Springfield Cornice Works, St. Louis Motor Carriage Co., Cunningham Engineering Co., Buffalo Electric Carriage Co., The Haynes-Apperson Co., Jos. Dixon Crucible Co., C. J. Downing, Diamond Rubber Co., C. F. Splitdorf, Gray & Davis, Veeder Mfg. Co., Rose Mfg. Co., B. F. Goodrich Co., Charles E. Miller, New York Tribune, (Mobile), Dow Portable Electric Assistant Co., Pennsylvania Auto and Gear Co., Goodyear Tire & Rubber Co., Gleason-Peters Air Pump Co., Consolidated Rubber Tire Co.

AUTOMOBILE TAXES IN SPAIN.

Vice and Acting Consul Geary reports from Malaga: I give below a resume of the new order relative to the local tax on automobiles, as follows:

The better class of private automobiles will pay, in cities having a population of 100,000 or more, a tax of about $11.58, for each vehicle, and for each seat, including that of the conductor, $1.36.

In cities having from 20,001 to 99,999 inhabitants, a tax of $5.79 for each vehicle will be charged, and for each seat of the same 69 cents.

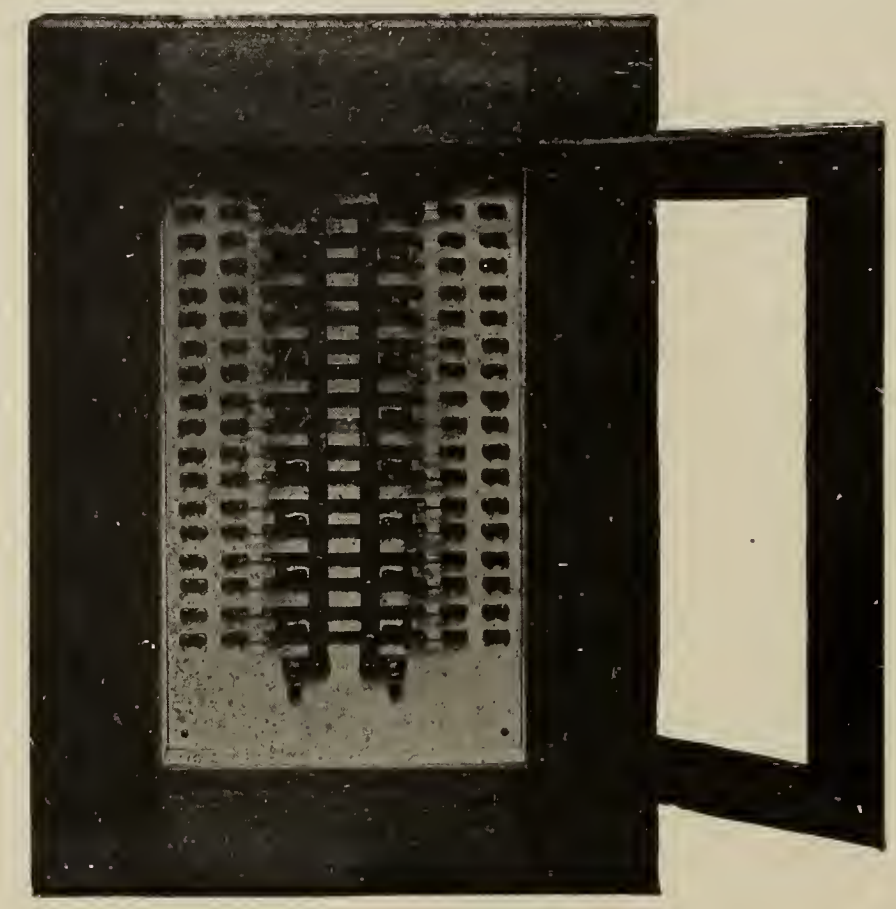
In other places of less than 20,000 people, the taxes are $2.89 for each vehicle and 34 cents for each seat.

Automobiles for traveling along the public roads will pay, for each kilometer (0.62 miles), 58 cents, and for each seat and kilometer of travel, 3.5 cents.

Lighting Specialties.

PANEL BOARDS OF MODERN CONSTRUCTION.

The design and construction of panel boards, knife switches, switchboards, and other electrical specialties occupies a field of its own in practical engineering. The Crouse-Hinds Electric Company, manufacturers of the above class of goods, with offices in New York, Chicago, Boston, Baltimore, Denver and San Francisco, main office and works at Syracuse, N. Y., have placed upon the market some of the most useful as well as artistically designed specialties for sale. The illustration shows the general appearance of a panel board meeting with great success among electrical engineers and contractors. The Hinds tubular arm knife switches have won a distinct reputation of their own and are made for any voltage and any capacity, from 25 to 5,000 amperes. The New York office is in charge of F. M. Hawkins, 23 Dey street. Mr. Hawkins' connection with the electrical business dates back for many years during which he has shown merit and adaptability of the highest order.



Crouse-Hinds Panel Board.

Electric Canal Haulage.

ELECTRIC TRACTION FOR CANALS.

BY RICHARD GUENTHER.*

Some interesting experiments in boat traction by means of electric locomotives were recently made on behalf of the Prussian Government by Messrs. Siemens & Halske, of Berlin. The scene of operations was a short length of the Finow Canal, which forms a partion of the waterway between Berlin and Stettin and is traversed every year by about 25,000 to 26,000 boats each way. The craft used are in the main barges, some 132 feet long by 15 feet 6 inches beam, carrying 150 to 175 tons. There are also a few steam barges employed, which carry about 150 tons and can tow a second barge. The traffic to Berlin is much heavier than toward Stettin, and as a consequence three-fourths of the barges return light from the metropolis. Traction is generally effected by horses, there being a towpath on each bank, but on the down journey man traction is not infrequently relied on. In any case the speed is low and, including stops, does not average more than about 1 1-4 miles per hour.

The section of canal used for the experiments was selected owing to its physical difficulties, presenting as it does several curves, in one of which with only 328 feet radius the waterway is spanned by a railway bridge. The line laid down for the towing engine was of 1-meter (3.28 feet) gauge, the outer rail weighing 18.2 pounds per yard, while the inner, which was fixed on the inner edge of the towpath, weighed 9.1 pounds per yard. These rails, which were of the flange type, were laid partly on sleepers ballasted with gravel and partly on blocks of concrete, weighing 220 pounds each in the case of the heavier principal rail, and half this in case of the other rail. This arrangement costs more per mile than the sleepers, but has been found less expensive to maintain. Though no wharf actually existed on the length of canal experimented on, the arrangements necessary were fully tested. At one point the line was raised to a height of 9 feet 6 inches above the level of the towpath, being carried on posts and brackets. The carrying posts were 12 inches in diameter, and were spaced at 18 feet 8 inches. A cap piece spanned the gap between posts and the principal rail was laid directly on this cap piece, while the other was carried by a stringer, supported at each post on brackets.

The conductor for the current was supported on pine posts 23 feet long, located 35 to 44 yards apart. It consisted of 8-millimeter wire, carried by procelain insulators. The principal rail served as conductor for the return curent. The source of power was a 15-horse-power portable engine, driving a 9-kilowatt dynamo; and a large storage battery was also provided. The extreme dimensions of the towing locomotive were 6 feet 10 inches in length by 4 feet 10 inches wide. Its total weight was 2 tons; but the motor was so placed that only one-fifth of this total came on the accessory rail. The motor provided was much more powerful than necessary for the work in hand, as it was capable of working at the rate of 14 to 15 horse-power. Since, however, these experiments were merely preliminary ones intended to test

*U. S. Consul-General at Frankfort, Germany.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., } ELECTRIC LIGHT AND POWER.
OSBORNE P. LOOMIS, E. E., }
JOSEPH MUIR, M. D., } ELECTRO-
FREDERICK STRANGE KOLLE, M. D., } THERAPEUTICS.

NEW YORK, OCTOBER 20, 1900.

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THE MALICIOUS LITTLE BUG.

In the editorial columns of our honored contemporary, the "Electrical World and Engineer," the following remarks appear: "Lives there the electrician who can watch a fire-fly without a trifling but persistent sense of annoyance? The little bug winks maliciously in the possession of his secret until the electrician goes home and turns on his five per cent. efficiency incandescent lamp to kick himself by." We do not care particularly to refer to the many electricians that do gaze at fire-flies without the least feeling of annoyance. Neither can we understand why the little bug should wink maliciously. But an objection must be taken to the stand made by our contemporary in allowing themselves to believe that the secret of the little bug is, as they think, undiscovered. Neither is the whole matter "in the air," as they state, and as far as material results are concerned a certain degree of ignorance is exhibited of the immense advance that has been made in vacuum tube lighting by the writer of the editorial we refer to. We know that one hundred and fifty thousand dollars were offered to a certain concern engaged in the vacuum tube lighting busines for the rights to employ their system for advertising purposes and certain decorative effects. If "no material results are at hand" it would seem strange that an offer of this kind should be made. It might be advisable for the "Electrical World and Engineer" to investigate more fully and find out the true status of vacuum tube lighting in the United States before making such statements as have appeared in their columns.

The difficulties met with in the production of a brilliant and uniform source of luminous energy have been, in many respects, overcome by D. MacFarlan Moore, whose system at present offers a very practical solution of the problem. The efficiency and the general advantages resulting from lighting of this character are of a high order. In the experiments performed by Moore, covering a period of many years, the primary object was to obtain a powerful white light and, in addition, to build a tube which would require no more attention than the ordinary incandescent lamp. To accomplish these things a vast amount of experimenting was necessary and eventually a tube was made in which light which was strong, white and steady was produced. In these tubes, which may be operated for many hours, the light was highly satisfactory and would fully meet the expectations of the most practical of engineers. The fire-fly's secret is largely a physiological one. It is like the secret of the gymnotus, or electric eel, or of certain rare types of plants, growing in the Indian jungles, that develop peculiar electrical characteristics. It is impossible to duplicate the hidden, mysterious processes through which fire-flies or insects of that order produce light. It is impossible for us to expect to equal such creatures in the efficiency or our methods any more than we can build a heat engine, involving such thermo-dynamic conditions that it approximates in efficiency that of man. The methods we must employ are electro-mechanical; the results we obtain will be, in many respect, deficient as compared with nature but the vast progress accomplished so far in so short a time will in all probability lead to greater success in the future.

GREATER NEW YORK AUTOMOBILES.

Visitors from Paris labor under the impression that New York has not as many automobiles as it should have because of its lack of asphalted streets. Tests of automobiles made by two Columbia University electrical engineers show that the consumption of power by automobiles passing over asphalt and paved streets is not appreciably different. It is therefore evident that Greater New York, though not suffering from a lack of automobiles, need not have its highways covered with asphalt to further their introduction. To begin with, the automobile factories are being rushed to death with orders. The Adams Express Company have large autotrucks in operation at present. Several well known champagne dealers have large vehicles of this kind in actual service and the leading daily newspapers, as well as the great drygoods stores, employ the automobile in their delivery service. It is only within the last twelve months that Greater New York people have been able to get automobiles, but judging from orders known to have been given, within another year or two no complaint will be made that there is a lack of them.

Fifth avenue, along which the most fashionable equipages glide, is now the scene of a medley of vehicles. All manners and types of automobiles enter into the general stream, from the most expensive type of electric brougham to the imported gasolene tricycle. It has been estimated that at least ten per cent. of the wealthier classes use the automobile not merely as a fad but through an appreciation of the advantage it possesses over the horse and carriage. This opinion is spreading among the humbler classes. The automobile has therefore become a fixed institution in Greater New York as well as Paris and London.

the possibilities of electric traction for large barges, the excess power was supplied intentionally, and the resistance requisite to call forth the full powers of the motors was in some of the experiments provided by rafts. These experiments showed the system to be capable of meeting all needs, working, as it did, with safety and economy.

Expositions.

PAN-AMERICAN EXPOSITION EMBLEM.

The official emblem of the Pan-American Exposition, which was designed by Raphael Beck, a Lockport artist, and was accepted as the most artistic and suitable of several hundred designs submitted, has the especial merit of effectively symbolizing one of the chief purposes of the Exposition, which is to bring into closer social and trade relationship the republics, States and Territories of North and South America. The emblem shows a fair maiden typifying the North, extending a kindly hand to clasp that of her brunette sister of the South, thus forming a bond of continental sisterhood and establishing a unity of sentiment and interests between the countries of the Western Hemisphere.



"A TRIP TO THE MOON."

The Midway at the Pan-American Exposition in Buffalo, in 1901, will be over half a mile long, giving a mile or more of frontage for the wonderful variety of novel entertainments there to be presented. It will outrival in interest and extent anything ever created in this line. It will include some of the best of standard attractions, vastly improved, and a strong array of new ones fresh from the fertile brain of the inventor and artificer. It will be a display of ingenuity impossible to anticipate by any process of extravagant reasoning or guessing. Who but a professional of ripe experience could have planned "A Trip to the Moon?" The voyager is directed to go aboard the airship "Luna," moored at a convenient landing. It is night, and the heavens sparkle with a myriad of stars. When all is ready the cables are thrown off and the ship rises steadily to a height of about two miles. The air is clear, and you can see the many lights on earth below. We now pass eastward over Rochester, Albany and then southward over New York. The earth now falls rapidly behind. We are going at a terrific velocity, as noted by the resistance of the air which seems to blow hard in our faces. The earth becomes a large ball and the moon grows larger. We are fast nearing the satellite, and soon find the ship moored to a

landing in the moon. Guides receive us and show us to the palace of the Man in the Moon. His Majesty receives the party, bidding them welcome and accords them the freedom of his domains. We are then shown about the splendid palace and through the streets of the City of the Moon. The ladies are especially interested in the show windows of the Moon shops. The trip may be made with entire safety, and the return to earth leaves one with the remembrance of having passed through a wonderful experience.

A PROSPEROUS YEAR.

In various ways the mileage of the New York Central Railroad has been increased during the fiscal year which closed on June 30th last until the road now owns and controls more than 10,000 miles of road. The annual report, which covers the operation of only 2,817 miles, shows remarkably satisfactory conditions. The increase in gross earnings over the previous year was not far short of $6,500,000, $2,000,000 of this being due to increased mileage and nearly $4,500,000 to general trade activity. The report also shows a wise disposition of this increased income and a tendency to useful economies in more than one direction. Altogether, the public, as well as the management of this great system, are to be congratulated on the showing.—Dry Goods Economist, New York.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.
PATENTS ISSUED OCTOBER 9, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of ten cents.

659,244. Circuit-controller. Adam Lungen, N. Y.

659,268. Electric lamp. Van Vleck and Stevens, N. Y. The film of a glow lamp receives allitional heat from the flame of a lamp placed beneath the film.

659,269. Annunciator for telephone exchanges. Benjamin Walker, Detroit, Mich.

659,357. Apparatus for locating faults in electric circuits. Wm. E. Athearn, N. Y.

659,389. Electric meter. Thomas A. Edison, Llewellyn Park, N. J.



659,409. Electric bipolar dilator. Chas. L. Mosher, Chatham, N. Y.

659,433. Perforator for preparing telegraphic messages. Chas. Buckingham and Emil German, N. Y.

659,443. Commutator and method of making the same. E. R. Gill, N. Y.

659,506. Magnetic regulator for galvonometers. James Bradley and Louis M. Pignolet, N. Y.

659,544. Telephone system. Frank D. Pearne, Davenport, Iowa.

659,550. Electric R. R. James Robertson, La Salle, Ill.

659,605. Electric thermostat. Leonard Des Isles, Cambridge, Mass.

Business News.

NEW INCORPORATIONS.

Union, N. Y.—G. S. Ackley, M. S. Squires and E. W. Van Slyke have recently incorporated the Lester Heights Water and Power Company; capital stock, $16,000.

Venice, Ill.—G. A. Niemann, M. Niemann and F. Kohl have incorporated the Venice Electric Light and Power Company, with a capital of $40,000, to operate an electric lighting plant.

New York City.—Empire Insulated Wire Company, of New York City. Capital, $25,000; directors: John E. Roeser, New York; S. B. Ferris, Madison, N. J.; J. B. Clark, Brooklyn.

Chicago, Ill.—The Acme Electric Company, of Chicago, has been chartered for manufacturing electrical supplies. Capital, $5,000; incorporators: I. M. Crane, C. B. Stafford, W. Y. Miller, all of Chicago.

Bloomington, Ill.—The Consumers' Heat and Electric Company was recently incorporated for $75,000, by G. S. Hanna, E. Thorp and G. E. Davis. Steam and electricity for all purposes will be furnished.

Los Angeles, Cal.—The Pacific Electrical Works, with main offices in Los Angeles, has been incorporated with a capital stock of $250,000, $500 of which has been paid up. Directors: Monroe Markham, G. L. Hardison, H. E. Carse, Los Angeles; L. W. Andrews, Ventura; Frank Taylor, Brookline, Mass.

TELEPHONE CALLS.

Sheridan, Ind.—The Central Indiana Telephone Company has been incorporated for $10,000.

Lima, Ohio.—A recent incorporation is that of the Lima Telephone Company, with a capital of $100,000.

Albion, Ind.—The Noble County Telephone Company has been incorporated by Thomas A. Huston, M. C. Beck and W. F. Beck; capital, $15,000.

Fostoria, Ohio.—The local branch of the United States Telephone Company is rebuilding its entire plant in Fostoria, the estimates calling for a total expenditure of $125,000.

Huntsville, Ill.—The Shiloh Mutual Telephone Company, of Huntsville, has received a charter to operate a telephone line. Capital, $900; incorporators: E. H. Grosclaude, J. E. Croxton, T. A. Wilson, all of Huntsville.

Dunkirk, N. Y.—The Dunkirk Home Telephone Company has been incorporated with a capital stock of $100,000, by Messrs. Dale, Sudeo and Chapman, of Elyria, Ohio, and A. R. Smith, of Tonawanda.

North Conway, N. H.—The North Conway Telephone Company has been incorporated with a capital of $5,000. The incorporators are: C. E. Gibson, C. E. Poole, J. Z. Shedd, D. W. Barnes and A. Eastman, all of North Conway.

Delmar, Pa.—The Delmar & Hoytville Telephone Company has been chartered to operate telephone lines. Capital, $2,000; incorporators: C. A. Gorris, C. A. Stewart, C. Steel, all of Delmar; D. H. Darby, of Hoytville; F. W. Marvine, of Antrim.

ELECTRIC RAILWAY NEWS.

Tacoma, Wash.—The Acme Magnetic Traction Company has been incorporated with a capital of $100,000.

Monaca, Pa.—Right of way to build a line from the Ohio River Bridge to the Pittsburg & Lake Erie Railroad station has been granted to the Monaca Street Railway Company by the town council.

Cleveland, Ohio.—The route for a branch line from Berea to Medina has been surveyed by Capt. E. J. Kennedy and the directors of the Cleveland, Elyria & Western Electric Line.

Selma, Ala.—It has been formally decided by the stockholders of the Selma Street Railway Company to increase its capital from $30,000 to $50,000. The directors have been authorized to build electric surface lines.

Nyack, N. Y.—Thirty miles of track will be laid in Rockland County by the Rockland County Traction Company, which was recently incorporated for $300,000. The termini of the road will be located at New City, Rockland Lake and Upper Nyack.

Guthrie, Okla. Ter.—R. T. White, of Fort Gill; J. F. Craig, of South MacAlester, and A. H. Howe, of New York, have incorporated the Union Electric Railway Company, at $122,000 capital stock. The company will build about 25 miles of street railway in South MacAlester.

Leesburg, Va.—An electric railway company has been organized to construct a line west and northwest through Alexandria, Fairfax and Loudon counties from Washington. The organizers are C. C. Campbell, of Fairfax County, and ex-Senator Henderson, of Missouri, who propose to erect a $60,000 power house on Mr. Campbell's farm about eight miles west of Washington. The company is capitalized at $300,000.

CORPORATION CHANGES.

Spokane, Wash.—The capital stock of the Washington Water Power Company has been increased by a vote of the stockholders from $1,500,000 to $2,000,000.

Pittsburg, Pa.—The Allegheny County Light Company has been sold for $125,000. The officers are George Hogg, of Braddock president, and J. M. Horner, secretary.

NEW INSTALLATIONS.

Galveston, Tex.—The city electric lighting plant, which was wiped out of existence by the recent storm, is soon to be rebuilt. D. Hall, the superintendent, will take charge of the reconstruction.

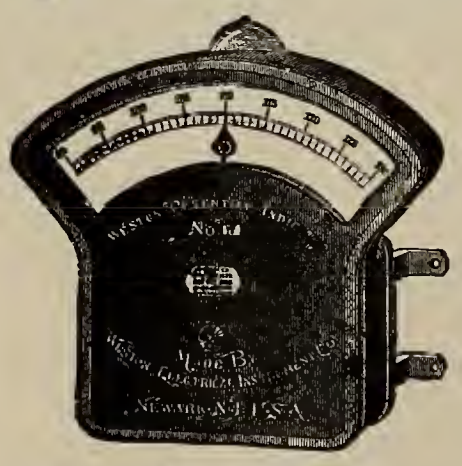
NEW YORK NOTES.

MR. H. L. SHIPPY, treasurer of the John A. Roebling's Sons Company, of New York City and Trenton, N. J., has returned from a tour of the Continent.

MR. S. BERGMANN, formerly the head of the General Incandescent Arc Lamp Co. of this city, but now of Berlin, Germany, is in town. Mr. Bergmann sold out his interest in the above company several years ago and settled in Berlin, where he is at the head of a large electrical corporation.

MR. H. M. GRANT, 14 Dey street, has made a specialty of hard and flexible fibre for twenty years and has a perfect knowledge of the requirements necessary for a perfect insulator. He guarantees the quality of his product to be of the highest grade for insulating purposes. Some of his specialties are hard fibre in sheets, rods and tubes, bushings, washers of all sizes and special shapes made to order; fibre paper for armatures, etc.

WESTON STANDARD ILLUMINATED DIAL



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THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

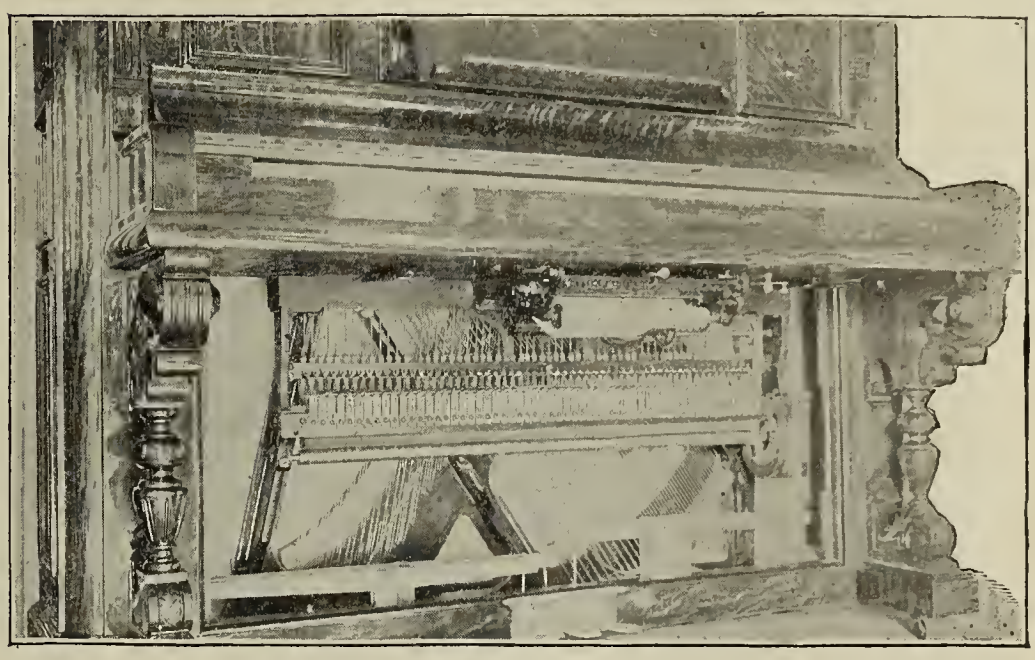
114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 17. NEW YORK, OCTOBER 27, 1900. Whole No. 702.

Novel Applications of Electric Power.



Piano with Pianophone Attachment.



The Pianophone.

THE PIANOPHONE.

We show herewith several views of the Pianophone of the Twentieth Century, which, being a purely electrical device for automatically playing any piano, should prove of special interest to our readers, particularly to those who have any musical taste but have not had the opportunity or the time to learn.

We havc called the Pianophone a purely electrical device, but this statcment needs some qualification to be accurate. The principles of thc Pianophone are electro-centrifugal. Explanatory of the above it is well to note at this point that many inventors in the past, including Edison, have attempted to operate the keys of the piano by a direct magnetic blow; but such devices have required high voltage currents, which are not available in more than one home in a thousand and therefore lack commercial value.

The Pianophone however, considering the power and the volume of tone produced, is evidently the most practical electrical device on the market, and it will be well for electricians to bear in mind, with a view of adoption in some of their future work, the novel method in which centrifugal force is combined with magnetic forcc of action.

Mr. G. Howlett Davis, the inventor of the Pianophone, has secured several basic patents upon this new principle a circuit which includes one of the magnets, the contact roller being the other terminal.

From the close scrutiny of the photographic views it will be seen that a rotary drum extends the length of the attachment, and having at one end the armature of a motor, the fields of which are made integral with the supporting bracket. Located directly above the drum and in close proximity thereto, is a series of friction shoes, corresponding with the number of keys to be actuated, said shoes being pivotally connected to the armature of a small magnet in such manner that when the magnet is energized, the shoe will be brought into contact with the revolving drum to be thrown over in the direction of rotation, thus throwing upward the striker rod connecting the rear end of the shoe and of the piano key. The circuit is made and broken there through the medium of a perforated music sheet, said perforation being in restriction with a series of contacting fingers over which said sheet passes the same motor



Interior of the Pianophone Company's Works.

of combining two different energies, but as his patents are limited to musical instruments the principle is still open for application to other purposes.

Proceeding to describe the principles of the Twentieth Century Pianophone we call attention to the two photographic views in which the Pianophone is shown as applied to a piano; in one of the views the inventor, Mr. Davis, is shown in company with Mr. F. G. Smith, the manufacturer of the celebrated Bradbury piano, the latter being the elder gentleman.

A small electric motor is placed inside the piano at the base and is direct connected to a long revoluble friction roller and belted to the mechanism which unrolls the perforated music sheet. Over this roller, which lies in a horizontal position, is a row of small horseshoe magnets, set vertically in a frame with their poles upwards. These magnets are set close together and each represents a key on the keyboard. Immediately above the contact roller is a frame carrying a set of small contact brushes of which there are as many as there are magnets or keys. Each brush is a terminal of that rotates the drum heretofor described and will propel the music sheet foward.

The rotary drum acts as fly wheel for the motor and therefor the power imparted to the friction shoe is secured almost free of this expenditure of extra power.

An extremely light current is all that is necessary to flow to the magnet in order to bring the shoe in contact with the roller.

The Pianophone can be successfully operated by any 4-volt battery and consumes about five amperes. The twenty watts required for one hour's playing a day can be supplied by a number of gravity batteries charging a small storage battery. Of course, where there is a charging dynamo or electric light service at hand the primary batteries can be dispensed with. Under the above arrangement the Pianophone is clearly available for use in any home having a piano.

Further details and drawings will be furnished by the manufacturers of the device, the Pianophone Company; factory, Willoughby and Raymond streets, Brooklyn, N. Y.; salesrooms, 5 East 14th street, New York city.

Conventions.

WALTON H. HOLMES, PRESIDENT-ELECT, AMERICAN STREET RAILWAY ASSOCIATION.

Walton H. Holmes, elected president at the American Street Railway Association's nineteeth annual convention at Kansas City, Mo., is one of the most prominent electric railway men in the West and has a reputation for tireless energy and great executive ability. The Metropolitan Street Railway Company, of which he is the president, is a proof of his capabilities in that direction.

Mr. Holmes was born in Kansas City, Mo., in 1863, and at the age of 12 entered the office of his father's, Nehemiah Holmes, horse railway company, and before he was 21 became its vice-president. He was educated at the college of the Christian Brothers, in St. Louis, Mo., but did not remain there very long, preferring the activities of business life to the more peaceful surroundings of college. After his father's death, he, with his brother, Conway F. Holmes, organized the Grand Avenue Cable Company and built the Grand avenue system.



Walton H. Holmes.

Under his management this property increased to such an extent that in 1895 it was merged into the Metropolitan Street Railway of which he became the vice-president and general manager and later president. Mr. Holmes is also president of the Kansas City Electric Light Company, besides being interested in other Kansas City enterprises.

Any public undertaking has always received his support and his influence has made itself felt in the city's growth. He is best described as a "hustler," and the American Street Railway Association is to be congratulated upon its new president.

THE CONVENTION OF THE AMERICAN STREET RAILWAY ASSOCIATION.

The nineteenth annual meeting of the American Street Railway Association was held at Kansas City, Mo., October 16, 17, 18 and 19, with about eight hundred members and visitors present. It will rank as one of the most successful meetings of the association, from a business as well as a social standpoint. The meeting was called to order Tuesday morning, October 16th, by President John M. Roach, who introduced the mayor of the city, Mr. Reed. After a short speech, in which His Honor dilated upon the advantages of Kansas City as a field for street railway investment, Mr. Roach resumed the rostrum and made his annual address. In the course of his remarks President Roach stated:

"From the single-track, one-horse car of forty years ago the business in which you are engaged has grown to a magnitude where nearly all fields of human endeavor are called upon to perfect its equipment or aid in its management. It has outgrown ridicule and financial instability and in the rapid whirl of events has built cities, enriched its promoters and made possible a freer, healthier and happier life for its patrons. Each day the street car is entering more and more into the business life and pleasures of the community, and each day its benefits are becoming more apparent to the general public.

"The street railways of America now represent the enormous investment in bonds and stocks of $1,800,000,000, upon which investors are receiving annually over $70,000,000 in interest and dividends. Salaries and wages amounting to $250,000,000 a year are distributed among the 300,000 employes necessary to equip, operate and manage this great industry, repair its 20,000 miles of track, handle its 60,000 cars and meet the ever-pressing demands for improvement. Directly and indirectly over 1,200,000 persons depend upon the traction interests of America for their livelihood.

"The last year has been a period of notable activity and healthy progress, with but few disturbances of a serious nature. The managers of large street railway properties should shape their policy toward their employes and the public so that disturbances between employer and employe will be entirely eliminated from their history. The management of the great corporations of the country can best retain the adherence and loyalty of employes by adopting toward them a policy at all times just, and at the same time courteous, kind and conciliatory. The good will of your employes and of your patrons will be found an asset of great value in the days of trouble and most desirable at all times.

"A business so widespread in its usefulness, holding and judiciously employing as it does so great a portion of the capital of the country and so essential to the best

interests and prosperity of the trade centers, should, and I believe in good time will, possess the very necessary good will and hearty support of the municipalities it so faithfully serves. Our interests and those of the public are inseparably interwoven and naturally harmonious. If the relations become strained and in conflict, such conditions are unnatural and illogical; therefore it should become one of the leading features of our association to suggest a uniform policy for street railway companies, and of so broad a gauge that the mutuality of the best interests of the public and of the company shall be as apparent to the people as to the street railway managers themselves."

The following programme was followed out: After the president's address the report of the secretary and treasurer, Mr. T. C. Penington, was read and showed a balance on hand October 10, 1900, of $7,000.75, a very satisfactory showing. At present there are one hundred and sixty-two street railway companies members of the association.

After the secretary's report had been read and ordered filed the president announced the first paper, "The Consolidation of Street Railways and Its Effect upon the Public," by Daniel B. Holmes, counsel of the Metropolitan Street Railway Company, of Kansas City, Mo. After the reading of the paper the meeting adjourned, the executive committee then holding a meeting. A reception was tendered the delegates at the Midland Hotel by the citizens of Kansas City on the evening of the 16th, and it was voted a great success by all present. During the Wednesday morning (October 17th) session the following paper was read by the secretary in the absence of its author, Mr. C. F. Bancroft, electrical engineer of the Massachusetts Electric Companies, Boston, Mass.: "Comparisons of the Various Systems of Electrical Distribution for Street Railways." This was followed by a paper on "Painting, Repainting and Maintenance of Street Car Bodies," by F. T. C. Brydges, superintendent of car shops, Chicago Union Traction Company. This paper was discussed by Messrs. Harrington and Foster.

The paper read at the Thursday (October 18th) meeting was "Double Truck Cars: How to Equip Them to Obtain Maximum Efficiency Under Varying Conditions," by N. H. Heft, president Meriden Electric Railroad Company, Meriden, Ct. It was discussed by Messrs. Foster, Chamberlain, Wason and Beggs. Mr. Riggs, chairman of the Committee on Nominations, then presented the following report:

"Your committee respectfully recommends New York City as the next place of meeting, and the following gentlemen for officers of the association for the ensuing year: President, Walton H. Holmes, president Metropolitan Street Railway Co., Kansas City, Mo.; first vice-president, Herbert H. Vreeland, president Metropolitan Street Railway Co., New York, N. Y.; second vice-president, N. H. Heft, president Meriden Electric Railroad Co., Meriden, Ct.; third vice-president, J. B. McClary, general manager Birmingham Street Railway Co., Birmingham, Ala.; secretary and treasurer, T. C. Penington, treasurer Chicago City Railway Co., Chicago, Ill. Executive Committee: The president, the vice-presidents, and John M. Roach, Chicago; F. L. Fuller, Wilkesbarre, Pa.; George W. Baumhoff, St. Louis, Mo.; John R. Graham, Quincy, Mass., and John Harris, Cincinnati, O."

The secretary was authorized to cast the unanimous ballot of the meeting for the gentlemen nominated. New York City was selected as the place for the next meeting. The following resolution was unanimously passed: "Resolved, That the next meeting of the American Street Railway Association be limited to three days instead of four, and that the day set apart for the personal examination, by members, of the supply men's exhibit, be the middle day of the interval."

The meeting then adjourned until Friday evening, when the annual banquet was held at the Midland. Friday was devoted to an inspection of the exhibits at Convention Hall. The following firms and individuals exhibited at Convention Hall: The American Vitrified Conduit Co., the American Steel & Wire Co., Auto-Appliance Co., Bierbaum & Merrick Metal Co., Harold P. Brown, John A. Brill Co., the Creaghead Engineering Co., the Cutler-Hammer Co., the Cutter Co., the Chris-

ELECTRIC—TWO F P Oct 23 .....

tensen Engineering Co., the Dearborn Drug & Chemical Co., the Dixon Crucible Co., Duff Manufacturing Co., the Electric Railway Equipment Co., Guy M. Gest; the Gould Storage Battery Co., the Garton-Daniels Co., the W. R. Garton Co., the Garl Co., the Gold Car Heating Co., Green Engineering Co., N. S. Hill, Speer Carbon Co., Partridge Carbon Works, W. S. Electric Signal System, Morris Electric Co., Lea Electric Mfg. Co., Ohio Brass Co., Lorain Steel Co., the Peckham Motor Truck & Wheel Co., National Carbon Co., Standard Underground Cable Co., Luther Stieringer, H. W. Johns Co., Walworth Mfg. Co., Merritt Electric Air Brake Co., Frank Ridlon Co., Rossiter, McGovern Co., Standard Paint Co., Pantasote, W. T. Van Dorn Co., Kinnear Mfg. Co.

The following entertainments were arranged by the Reception Committee: Tallyho ride for the ladies on the morning of October 17th around the city; theater party at the New Coates Theatre; visit to Heim's brewery; vaudeville entertainment arranged by the supply men at Convention Hall, and a trip to the Armour plant in Kansas. All of these diversions were hugely enjoyed by all attending.

CONVENTION OF THE STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

The fourth annual meeting of the Street Railway Accountants' Association was held at Kansas City, Mo., simultaneously with that of the American Street Railway Association. The meeting was opened on October 16 at Convention Hall and adjourned October 19. It was opened by President C. N. Duffy, who introduced Mr. Daniel V. Kent, auditor of Kansas City. After Mr. Kent had welcomed the delegates the president made his annual speech, which was followed by the reading of a number of interesting papers. The secretary and treasurer's report showed a membership of 96 and a balance of $895.24.

ELECTRIC TRAMWAYS IN VALENCIA.

I wish to supplement my report dated April 7, 1900, on electric tramways in Valencia by the further information that the negotiations for the transfer of the lines mentioned to Messrs. Thompson, Houston & Co. on a forty-year lease have been brought to a successful issue. The leases are to substitute electricity for horse traction; to deposit as guaranty 750,000 pesetas (about $108,000) in French bonds; to pay a yearly rental of 160,000 pesetas (about $23,000) while receipts are below 800,000 pesetas. When receipts reach this figure, the lessors are to receive 5 per cent. more, and when they reach 1,000,000 pesetas 10 per cent. The whole electric plant is to be the property of the lessors, who are also to possess the right to devote to public lighting any surplus electricity generated. Electric machinery and plant, as at present arranged, will be supplied by the General Electric Company of New York; but the cars will be constructed in Spain, where a few factories recently established turn out fairly good and cheap work, though in elegance, solidity, and comfort the cars are not equal to best foreign-made products.

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NEWTON HARRISON, E. E., EDITOR.

ASSOCIATE EDITORS:

ALFRED E. WIENER, E. E., OSBORNE P. LOOMIS, E. E., } ELECTRIC LIGHT AND POWER.

JOSEPH MUIR, M. D., FREDERICK STRANGE KOLLE, M. D., } ELECTRO-THERAPEUTICS.

NEW YORK, OCTOBER 27, 1900.

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STREET RAILWAYS IN ENGLAND AND ON THE CONTINENT.

The general reader has but a limited idea of the immense amount invested in street railways abroad. Popular opinion tends to the belief that the United States is the only country equipped with facilities of this description. It is true that we find more electric railways here than anywhere else in the world, but for variety in construction Germany, France, England, Austria, Switzerland, Italy, Ireland, Russia and even Portugal have roads that compete well with the most remarkable in America. The United States has over 12,000 miles of road and more than 35,000 cars in operation. In France there are 82 miles of street railways, supplied by stations aggregating 5,000 horse power, while in England there are only about 60 miles of railway and 4,000 horse power. Strange to say, Germany heads the list with about 250 miles of track, almost 1,000 cars and over 7,000 horse power. The development of street railway interests is therefore greater in Germany than anywhere else on the Continent, placing her third to the United States. In Holland and Portugal we find respectively two miles of street railway. This is, of course, to be expected of Holland, the land of dikes and ditches, but it is a very poor showing for Portugal. In Canada the development of the street railway industry is attaining large proportions. In Canada we find about 450 miles of track and over 1,000 cars in constant use, placing her second to the United States. It would almost seem as though progress and enterprise could be estimated in any land better with respect to the miles of street railway installed than in comparison with anything else. The street railway has practically displaced street cars all over the United States, and in consequence the street railway business, with all its varied branches, has become more firmly founded than could have ever been anticipated.

The success of American street railway systems abroad has not only been due to the natural facilities at our command in the line of cheaper material, through the ownership of coal and iron mines, etc., but is due to a large extent to the systems employed in manufacturing the essential elements required. The American manufacturer has placed his foot securely in foreign markets and can now compete on the continent with not only quality and price but as regards time of delivery. This fact alone has had an immense influence abroad in securing to American manufacturers orders and contracts that otherwise they never could have secured. The activity of American manufacturers is illustrated by the statistics of the imports of manufactured materials and exports of manufactured goods which have just been made public by the Treasury Bureau of Statistics. These statements relate as directly to the electrical business as to those other branches of industry which collectively represent the aggregation of capital involved. In the eight months ending with August, 1900, imports of raw materials for use in manufacturing amounted to, in round numbers, $200,000,000, against a little over $100,000,000 in the corresponding months of 1896. The exports of manufactured goods were $304,000,000 against $163,000,000 in the corresponding months of 1896. Raw materials for use in manufacturing formed in the eight months of 1896 but 23½ per cent. of the total imports, while in the corresponding months of 1900 they formed as high as 35 per cent. The exports of iron and steel in 1896 only equalled $30,000,000. In 1900 they were more than $87,000,000. Scientific instruments, which barely touched $2,000,000 in 1896, exceeded $4,000,000 in 1900.

EXPOSITIONS VERSUS LEGITIMATE ADVERTISING.

The question has been put to a number of American exhibitors at the Paris Exposition whether it really paid them. The concensus of opinion seems to be that it has not, compared to legitimate advertising, and, although we will probably be accused of being biassed, we believe that the amount spent in exhibiting at the various expositions which are held from time to time is practically so much money wasted. One prominent firm states that "the same amount of money put into legitimate advertising and publishing of business would be much better. We would be delighted if no expositions were ever gotten up again where there was a chance to exhibit our line of goods, but as long as they are gotten up and our competitors exhibit there, we think we ought to go and show all visitors the best that the country affords. Hence we go into the large and unprofitable expense as patriots rather than as tradesmen." "There's the rub," as Shakespere puts it, the exhibits of competitors and the appeal to a manufacturer's patriotism. Nine tenths of the visitors at an international exposition are merely sightseers and take no interest, or at least but a very lukewarm one, in the large and costly exhibits prepared by the manufacturers of machinery, etc. The other tenth is already well acquainted with the merits and demerits of the various kinds of apparatus on exhibition and therefore turns its attention to other things. The day of the international exposition has passed, due to the enterprise of manufacturers in other directions, namely, newspaper advertising and the attractive catalogue, which do the work an exhibit is supposed to do at a minimum of expense and in a more thorough manner.

Political.

ELECTRICAL MEN IN THE SOUND MONEY PARADE.

Preliminary steps having been taken last week to create a separate electrical division of the great sound money parade which is to take place in New York City on Nov. 3, another enthusiastic meeting of the committee of initiative was held at Room 20, 30 Cortlandt street, on Oct. 22, when it was voted to name the division the Electrical Industries Association of the Sound Money Parade. Regular organization was effected as follows: President, E. S. Keefer; vice-president, Allan S. Bakewell; secretary, H. B. Kirkland; treasurer, G. L. Patterson; marshal, H. L. Shippy. These form the executive committee, with Dr. S. S. Wheeler, John H. Dale and T. C. Martin. A finance committee was appointed, composed of the treasurer, Dr. Wheeler and J. W. Godfrey. A committee on badges, flags, canes and general equipment was formed, comprising H. F. Albright, C. S. Pease and J. W. Dale. Secretary Kirkland was appointed a committee of one on music, and Mr. Martin a committee of one on press. From the reports already filed it is evident that not less than 3,000 marchers may be counted on from the electrical industries, and at the rate applications for a place in line are rolling in the number may easily run up to 4,000 and even 5,000. The total of the parade is already 125,000. In the electrical division the Western Electric men will turn out 1,500 strong under Mr. Albright, president of their association. The Crocker-Wheeler contingent will be upward of 500; the Sprague Electric body Mr. Bakewell estimates already at over 400. These will all have bands of their own, as will the Safety Cable contingent. The Electrical Association has already contracted for the services of three fine bands also, so there can be no doubt that at least the electrical division will step to music. Large electrical manufacturing concerns, supply houses, contractors, etc., are all enrolling, and applications for a place should be filed immediately with Mr. Kirkland at Room 20, 39 Cortlandt street, where work is already being pushed most actively. Among those who have participated in the recent meetings for organization are those above named and many others, including Messrs. Beran, Albright, Littlefield, Williams, Hall, Eckert, Blackall and Rice. The officers not only invite personal participation in the work, but solicit subscriptions. This is the first time that the electrical industries have "lined up" as such before the New York public, and there is the keenest desire everywhere in the local trade that an impressive front shall be shown. Marshal Shippy is already busy with the many important details of organizing his forces and arranging for place in the parade, time of starting, etc. Other meetings will be held during the present week, and practically daily up to the date fixed.—"Electrical World and Engineer."

Automobiles.

THE AUTOMOBILE SHOW.

All of the exhibitors at the Automobile Show, which will be held in the Madison Square Garden Nov. 3d to 10th, are making special preparations to give the finest exhibition of the kind that has ever been held. Some of the makers of the horseless carriage will show as many as a dozen vehicles, ranging in price from $500 to $3,000, and in their finish they will vie with the best carriages ever turned out. The automobile has come to stay, and in a short time it will displace the horse in many ways. Of course, it can never be expected to succeed him in many purposes, but there will, before long, be as much change in the streets of the city as far as carriages are concerned as there is in the street cars, few horses being left on the city lines, and those are to go within a short time. The show next month will give intending purchasers an opportunity to see more styles within a short time than ever before, and it will also give the general public an opportunity to see the coming carriage and convert them to the idea that a means of conveyance has come that is equalled by no other.

The Automobile Club of America, under whose auspices the show is to be run, is made up of both manufacturers and owners of automobiles, and each section will try their hardest to make the exhibition a thing to be remembered for some time to come. Preceding, as it does, the Horse Show, it will take place after most of the people of this city have got back to town for the winter, and society will be well represented in the Garden. This is assured by the vogue of automobiles last summer at Newport, when they were to be seen everywhere and each owner seemed to be trying to see how he could outdo the others in completeness of rigs. Next year the parade of automobiles on Newport's historic drives will be greater than ever before, and the Garden exhibition will give New Yorkers an opportunity to see what it is that brought about this great change. Not one person in a hundred has any idea of the magnitude of the industry, and the natural curiosity which is sure to draw them to the Garden during the show will result in an education.

The time is coming when the appearance of automobiles on the city streets and country roads will cause nothing more than a passing glance, where now they are watched with interest. Intimate acquaintance with the machine will do this, and the Automobile Show is going to teach the public what a good thing the horseless carriage is and how it has been developed in a short space of time in America.

In addition to the exhibition of new machines there will be a lot of foreign carriages shown by members of the Automobile Club of America. A. C. Bostwick will exhibit his new Ranhard & Levasser carriage, the fastest in America, having 24-horse power; D. W. Bishop will show his 16-horse power carriage of the same make; S. T. Davis, Jr., a steam racing carriage; A. L. Riker, an electric racing carriage, and Alex. Winton a gasoline racing carriage. Besides the vehicles on exhibition the makers will have stored at the east end of the Garden between fifty and seventy-five carriages, which will be run on the track, and it is the intention of the management to have from twenty to twenty-five carriages moving on the track at all times during the show, except when competitions are on.

Educational.

A COURSE OF TEN LECTURES FOR JOURNEYMEN ELECTRICAL WORKERS.

In these lectures it is intended to provide information that will be helpful to the electrical journeyman in his practical work. Problems of daily occurance will be discussed and explained, accompanied by practical demonstrations. The lectures will be given on Friday evenings at 8.15 o'clock, with an interval of two weeks between each lecture. The course will embrace the following subjects: Friday, November 2, 1900.—Volts, Amperes and Ohms. A simple demonstration and explanation of the units of pressure, quantity and resistance. Friday, November 16, 1900.—How to calculate the size of wires for leads, feeders, mains, etc., for both light and power. Friday, November 30, 1900.—The Dynamo or Generator. Its construction, operation and output. Thorough explanation of all its parts. Friday, December 14, 1900.—The Electric Motor. Its construction,

operation, efficiency and maintenance. Wiring for same. Friday, January 4, 1901.—Connecting Motors and Dynamos. Testing for polarity, leakage and grounds. Friday, January 18, 1901.—Switchboards. Laying out switchboards for isolated plant and for street circuit, singly and combined; busbars switches and connections. Friday, February 1, 1901.—Circuit Breakers, Rheostats, Volt and Ammeters for Switchboards. Purpose and design of each to be thoroughly explained. Friday, February 15, 1901.—The Three Wire System. Why used and where, with demonstrations. Friday, March 1, 1901.—The Storage Battery. Its construction, operation and maintenance. Friday, March 15, 1901.—Isolated Plants. Including dynamo, motors, lights, switchboards, wiring, etc.

Many of the lectures given nowadays on electrical subjects are too deeply scientific for the practical workman. They are more fitted for the engineer. This course which is now offered will be the reverse, and each lecture has been arranged with a view of meeting the needs of the practical workman. The lectures will consist of simple talks, illustrated by experiments and demonstrations. The aim will be to give information that will be useful and of value to the electrical journeyman in his every-day work, in relation to materials, proper methods of doing work, and the why and wherefore of doing work in a certain way. On conclusion of each lecture questions from anyone in attendance, and bearing on the subject under discussion, will be answered. The lectures will be conducted by Arthur A. Hamerschlag, under the auspices of the New York Trade School. For tickets or information apply to New York Trade School, First avenue, 67th and 68th streets, New York.

Among the Societies.

NEW YORK ELECTRICAL SOCIETY. PARIS EXPOSITION NIGHT.

The 208th meeting of the society will be held at the College of the City of New York, 23d street and Lexington avenue, on Tuesday, October 30th, at 8 P. M. The evening will be devoted to a symposium on the Paris Exposition and the Paris Electrical Congress. The subject will be profusely illustrated by lantern slides. Addresses on its various branches are expected from President Hering, of the American Institute of Electrical Engineers; Dr. A. F. Kennelly, Prof. F. B. Crocker, Mr. C. O. Mailloux, Mr. T. C. Martin and others who have visited the Exposition and participated in its Congress. This meeting will also be ladies' night.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED OCTOBER 16, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of five cents.

659,656. Testing transformers, etc. Augustine R. Everest, Lynn, Mass.

659,658. Electric arc lamp. Richard Fleming, Lynn, Mass.

659,660. Apparatus for periodical generation of electric currents by motors of irregular driving power. Max Gehre, Rath, Germany.

659,664. System of electrical distribution. Charles Green and John Callan, Lynn, Mass.

659,671. Magnetic blow-out or fuse-box. Edward Hewlett, Schenectady, N. Y.

659,687. Electric incandescent lamp. Frederick Myers, New York.

659,691. Telephone transmitter. George Perkins, Medford, Mass.

659,694. High-potential trolley system. William Potter, Schenectady, N. Y.

659,710 and 659,711. Electric arc lamp. George E. Stevens, Lynn, Mass.

659,716. Adjusting reluctance of magnetic circuits. Elihu Thomson, Swampscott, Mass. The reluctance-adjusting device is composed of laminated magnetic material in the form of a solid of revolution and having laminae arranged parallel to the axis.

659,759. Telephone exchange system. James McQuerrie, Chicago, Ill.

659,760. High frequency transformer. Chas. Noxon, Syracuse, N. Y.

659,766. Automatic electric cut-out. John H. Robertson, Morrison, Ill.

659,768. Pilot signal for telephone switchboards. Charles Scribner, Chicago, Ill.

659,824. Circuit controller for electrical mechanism. William A. McCallum, Cincinnati.

659,828. System of electrical distribution. Edwin Rice, Schenectady, N. Y.

659,828. Dynamo electric machine. Willard F. Richards, Buffalo, N. Y.

659,946. Electric switch. George Whittingham, Baltimore, Md.

659,958 and 659,959. Telephone exchange system. William Davis, Chicago, Ill.

660,021. Electricity meter. William M. Mordey and Guy Fricker, London, Eng.

660,043. Electrical furnace. William Borchers, Aachen, Ger.

660,047. Electric-lighting system. Joseph I. Conklin, New York, N. Y.

660,054. Controlling brakes for motors. Arthur C. Eastwood, Ensley, Ala.

660,065 and 660,066. Traction system. Frank J. Sprague, New York.

Business News.

MEETING OF THE SPRAGUE ELECTRIC COMPANY.

The following officers were elected at a recent meeting of the board of directors of the Sprague Electric Company: John Markle, president; Edward C. Platt, first vice-president; Allan C. Bakewell, second vice-president; Charles P. Geddes, secretary; H. R. Swartz, treasurer and assistant secretary.

A SUCCESSFUL ELECTRICAL CONTRACTING FIRM.

Messrs. Hatzel & Buehler, the well known electrical engineers and contractors, of No. 114 Fifth avenue, New York city, have secured the contract for the electrical equipment of the additions to the Prudential Insurance Company's building at the corner of Broad and Bank streets, Newark, N.J. The generating plant will consist of 3-350 K. W. and 1-155 K. W. Bullock generators, direct connected to Ball & Wood engines. Four thousand five hundred and fifty lamps will be installed in one department and 2,603 in another. The dynamos and engines will be installed in the new power house, situated at the corner of Bank and Halsey streets, called the North Building of the Prudential Company. This plant when complete will be the largest isolated plant in the world, and altogether the company will use over 20,000 lights in both the old as well as new buildings. Nothing but the best rubber-covered copper conductors will be used throughout this installation. The switchboard, which will be built by Messrs. Hatzel & Buehler, will be about 30 feet by 10 feet high and will be equipped with Weston automatic over and underload instruments

and single and double throw switches of every capacity.

Hatzel & Buehler have also secured the contracts for installing a 2,500 light plant at the Windsor Arcade, 47th street and 5th avenue, New York city, and another 2,500 light plant in the residence of E. J. Berwind, of Newport, R. I.

This concern is the largest and oldest firm of electrical contractors in this vicinity, having been organized in 1889. Messrs. Hatzel & Buehler both served their apprenticeship in the service of the old Edison Electric Light Company. Their services have been called upon for the installation of electrical work of all kinds and we give below a few of the prominent buildings and residences in which they have installed plants: American Surety Building, Broadway and Pine street, N. Y., 4,500 lights; N. Y. Herald, 4,000 lights; Hoffman House and Annex, 4,000 lights; St. James Building, Broadway and 26th street, N. Y., 2,500 lights; St. Paul Building, Broadway and Ann street, N. Y., telephone and messenger call system; Rogers, Peet & Co., Broadway and Warren street, N. Y., 1,800 lights; Elbridge T. Gerry, residences in New York city, Lake Delaware, Pa., and Newport, R. I.; G. W. Vanderbilt, Biltmore, N. C.; Cornelius Vanderbilt, Newport, R. I.; W. K. Vanderbilt, N. Y.; H. O. Havemeyer, N. Y.; Archibald Rogers, Hyde Park, N. Y.; G. G. Haven, N. Y., and many others.

NEW INCORPORATIONS.

Lake City, N. J.—Capitalists of Lake City, N. J., have incorporated the Lake City Electric Company for $20,000. Light, heat and power will be furnished.

New York City.—The Bishop Electrician Company, of New York, has recently been chartered at Dover, Del., with a capital of $50,000.

Gowanda, N. Y.—Charles P. Dean, George B. Pratt and C. E. Sipple have incorporated the Gowanda Electric Light and Power Company for $10,000, to furnish light and power for the village.

Versailles, Ind.—The Versailles Electric Company has recently been incorporated with a capital stock of $18,000 to build plants for electric lighting, heat and power.

Salem, Ore.—The Salem Light, Heat and Power Company has been incorporated for $40,000, by local capitalists, to operate electric light and steam heating plants in that city.

Los Angeles, Cal.—Los Angeles has been selected as the location for the main offices of the Pacific Electrical Works, which has recently been incorporated with a capital of $250,000. Monroe Markham, G. L. Hardison, L. W. Anderson, H. E. Carse and Frank Taylor are the incorporators.

Lancaster, Pa.—T. K. Worthington, a local broker, acting for capitalists whose identity has not yet been made public, recently secured a majority of the stock of both the Lancaster Gas, Light and Fuel Company and the local Edison Electric Company. It is stated that the prices paid for the stock were $60 per share for the gas and $10 for the Edison. Details have been refused and the statement that Brown Brothers & Juliette, Philadelphia bankers, are the parties interested is unauthenticated.

TELEPHONE CALLS.

Streator, Ill.—Local capitalists have incorporated the Streator Independent Telephone Company for $40,000.

Albion, Ind.—The Noble County Telephone Company has been incorporated for $15,000, by T. A. Huston, W. F. Clapp and M. C. Black.

Beloit, Wis.—The Farmers' Telephone Company, of Beloit, Wis., has been incorporated by G. N. Wiswell and Henry G. Goll for $100,000.

Easton, Md.—The system of the Diamond State Telephone Company will be greatly improved in the near future. About $20,000 will be expended in the work.

Santa Fe, N. M.—The Deming Mining and Milling Company and the Grant County Telephone Company have recently been incorporated in Santa Fe, N. M., for $30,000 each. The respective offices will be in Deming and Silver City. Local capital is largely interested.

Hornellsville, N. Y.—A telephone service will be operated between Hornellsville, Olean, Wellsville and intermediate villages in New York. The company has been incorporated for $50,000 and will be known as the Hornellsville Telephone Company.

Fostoria, Ohio.—The Oil Belt Telephone Company, of Fostoria, Ohio, has been incorporated with a capital stock of $10,000 by Kora F. Bigger, W. S. Wagner, John S. Hayman, Thomas J. Martin and Roscoe L. Carle. They will do a general telephone business in and between Rising Sun and Arcadia.

STREET RAILWAY NEWS.

Bay City, Mich.—Stockholders of the Consolidated Street Railway, of Bay City, Mich., have incorporated the Traction and Power Company for $50,000.

Columbus, Ohio.—C. P. West, W. R. Smith and others have recently incorporated the Columbus, Mt. Sterling & Washington Electric Railway Company for $100,000.

Collinsville, Ill.—An increase of the capital stock of the Collinsville, Caseyville & East St. Louis Electric Railway Company has been decided upon by the stockholders. This will bring the figures up to $100,000.

Peru, Ind.—A trolley is to be built in the near future from Peru to Wabash by New Haven (Ct.) capitalists who have obtained a charter and will begin work early in the spring. The road is to be eighteen miles long and will cost in the neighborhood of $270,000. Major D. A. Blakeslee is president of the new company.

Albany, N. Y.—Permission for the issuance of bonds to the amount of $450,000 by the Rochester & Suburban Railway Company has been granted by the railway commissioners. The funds thus obtained will be devoted to a reorganization of the company as well as to considerable new construction work.

POSSIBLE INSTALLATIONS.

McKeesport, Pa.—Bonds to the amount of $50,000 have been authorized by the Finance Committee for the construction and maintenance of a municipal electric lighting plant.

AUTOMOBILES.

Detroit, Mich.—The Detroit Riker Automobile Company has been incorporated at Detroit, Mich., with a capital stock of $25,000, $18,800 of which is paid up.



WESTON STANDARD

PORTABLE DIRECT READING

VOLTMETERS

AND

WATTMETERS

For Alternating and Direct Current Circuits.

The only standard portable instrument of the type deserving this name.

Write for our Catalogue of Portable Instruments.

WESTON ELECTRICAL INSTRUMENT CO.,

114-120 William Street, Newark, N. J.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.

LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 18. NEW YORK, NOVEMBER 3, 1900. Whole No. 703.

Novel Applications of Electric Power.



Wood's Landau. (See page 142.)

THE DEVELOPMENT OF THE AUTOMOBILE INDUSTRY.

When the first automobile show took place the visitors attending it came more out of curiosity to see the wonderful horseless carriage, the verification of a biblical prophecy, than with any idea as to the future development that would occur in this particular branch of the manufacturing art. The automobile, like any other innovation, is bound to pass through successive stages of evolution, to be pruned, reshaped and so changed as to meet the various conditions to which it is bound to be exposed. To speak of an automobile is but to refer to a device which runs through the streets with its own supply of power on board. The device may be driven by the most familiar of forces, steam, for instance, or those that have later come into use, such as gasolene, naphtha, acetylene, alcohol and finally electricity.

The engineering proposition seems at first sight to be an exceedingly simple one. It appears to be the adjustment of an engine to a vehicle. But experience has shown that it is somewhat more than this. It is in addition to the things above enumerated a noiseless vehicle; a vehicle that can readily turn corners without upsetting; a vehicle that can be governed and controlled by means of a small lever, and finally a vehicle having a degree of efficiency that makes it interesting to the business man as well as the layman in a practical sense. The industrial development, therefore, of the automobile industry is of necessity due to the circumstances of city life that have had so great an effect upon the development of large businesses.

The automobile is not confined in its use to merely supplying a luxury to the rich man; it has another function to perform which, in certain respects, is of more vital importance than this. It is that of supplanting the horse in our city streets; of taking the place of the express wagon, the truck, the van and the delivery wagon. In this respect the automobile is eminently adapted to perform a service which, when thus performed, is done at its best. It is not necessary to discuss the hygienic advantages resulting from the absence of the horse on our streets. Nor need we consider the saving in space in crowded thoroughfares where vehicles are apt to be blocked. But the saving in time, the comparative inexpensiveness of operation, the ease of control, all these

things, in total, represent much to the man of business and it may well be said that the industrial development of the automobile is to a large extent based upon these things.

At present there seems to be no industry more new, interesting and prosperous than the manufacturing of automobiles. From the standpoint of profit there is more to be realized, and in various other respects the changes that have come about and are to occur will be through the introduction of this new, remarkable and permanent institution. It has been estimated that nearly a billion dollars is now invested in the automobile industry. This, as a capitalization, is not too much. For city life the adaptability of the automobile is admitted by even the most pessimistic minded. When the farmer is considered, thousands upon thousands of whom could use the automobile to great advantage, it seems as though the demand will always be greater than the supply when these necessary adjuncts to civilization are fully aware of the advantages of this new type of vehicle.

At the Automobile Show, now being held at Madison Square Garden, New York, the most prominent types of automobiles manufactured are being shown. Considering the short time since this industry began to be developed in this country, Americans have little to complain of the amount of progress which has been made. In fact, they have good cause to congratulate themselves, as it has been shown on several occasions at many foreign exhibitions that the American vehicle is the superior of all makes in elegance of design, in finish, in lightness and in efficiency. The majority of the vehicles described and illustrated in our columns will be found at the Show, and we think our readers will discover on visiting the Garden that the present automobile has certainly reached a point of perfection that leaves little to be desired as regards appearance and durability.

WOODS MOTOR VEHICLE CO.

The Woods Motor Vehicle Co.'s exhibit is located in Section "F" on the north side of the main aisle, and while not as extensive as some of the other manufacturers, makes up for the lack of quantity in the superior quality of design, construction and adaptability of the vehicles shown. In addition to the above exhibit a number of other styles will be shown by this company on the track designed for the use of exhibitors, which will show the carriages in operation. The Woods Motor Vehicle Co., while its factories are in Chicago, maintains a New York office at 51 East 44th street and a large repository and repair shop at 154 East 57th street, where every attention will be accorded visitors or others interested in electric vehicles.



Wood's Wagonette.

The vehicles manufactured by the above company are so built that all moving parts provided with ball bearings are interchangable and the vehicle is so constructed that durability and efficiency are the first consideration and not a saving in first cost of construction. The Woods vehicles have three and four speeds which are controlled by the same lever that governs the brake, thereby requiring attention at only two points in the running of the automobile. When the vehicle is not in use the key is removed from the reversing switch and progress is thereby rendered impossible. This prevents the possibility of accident of any description. The vehicles run

backward and forward with equal facility and will cover a distance of from fifty to seventy-five miles a day. The batteries employed are peculiarly small and light. In fact, so much so that in this type of carriage it would require examination to discover where they have been placed. The batteries are placed in groups of four trays and are readily interchangeable. They may be insured for a period of five years at a nominal sum. The elegance of design manifested by the manufacturers of the Woods electric vehicle in addition to the remarkable lightness of these vehicles places them among the foremost on the market.



Wood's Depot Wagon.



Wood's Special Delivery Wagon for the Pabst Brewery, Milwaukee, Wis.

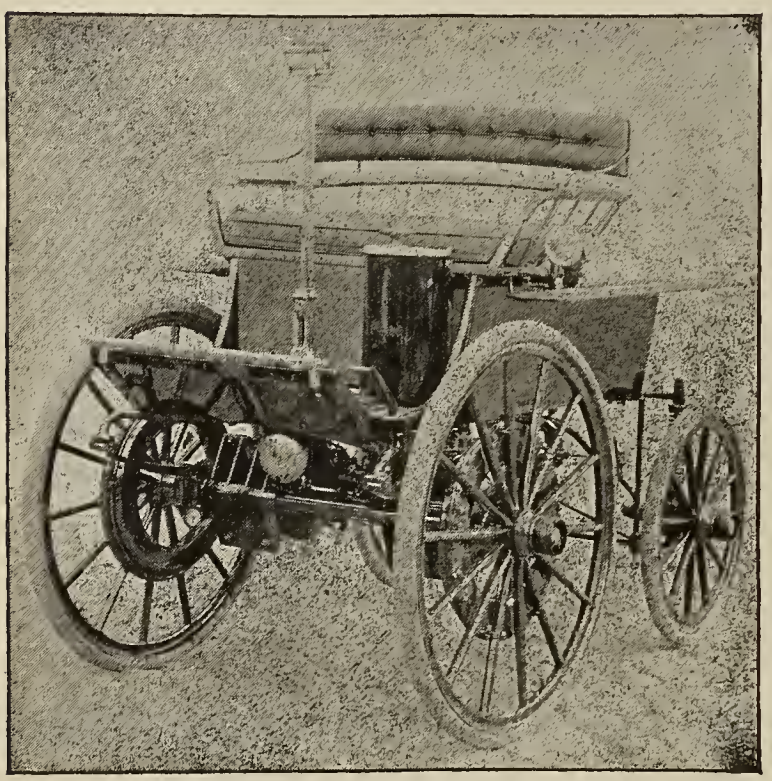
DESCRIPTIONS OF THE DIFFERENT STYLES OF COLUMBIA AUTOMOBILES TO BE EXHIBITED AT THE MADISON SQUARE GARDEN SHOW.

MARK III.—COLUMBIA PHAETON.

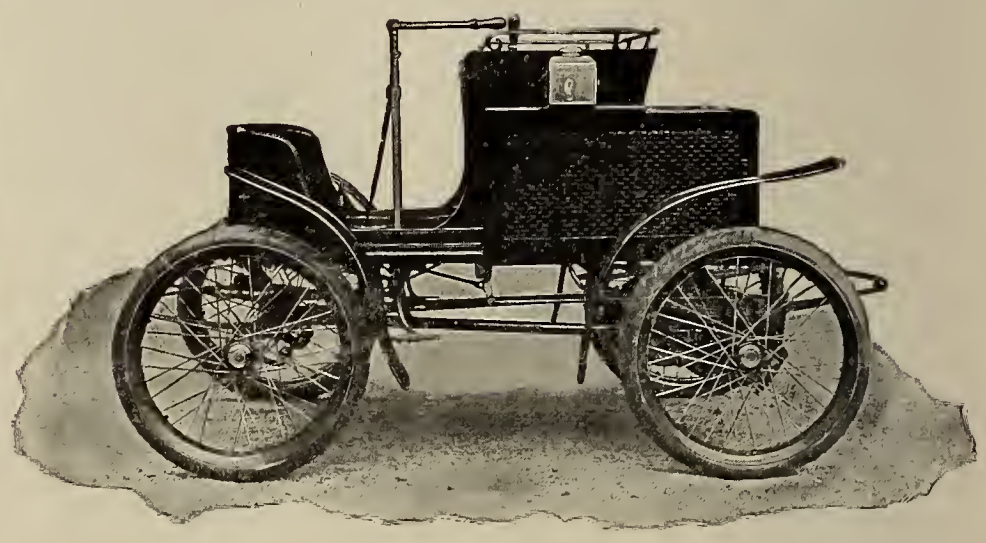
This vehicle is one of the best known and most popular styles of automobiles built by the Electric Vehicle Company. They have delivered to their customers over two hundred, of which number sixty have been shipped to Paris. It corresponds in style to the most luxurious horse-drawn mail phaeton or Stanhope. The finish is in shades of dark green, and every detail of both finish and trimming is of the highest class obtainable. The wheels are wooden with heavy pneumatic tires and are mounted on ball bearings, as are the other moving parts. The third seat at the rear, or rumble, makes provision for a groom or other attendant. If desired, however, this seat may be removed and the tailboard shut up. Besides being in demand for park and other pleasure riding, this particular variety of automobile is adapted especially for physicians. The top when raised propects far over, and with a boot, ample protection is afforded against the weather. The milage capacity on one charge of the batteries supplied as standard is thirty. The speeds are three, six and twelve miles per hour.

MARK XII.—COLUMBIA RUNABOUT.

This remarkably light and easy running electric vehicle has been a great favorite from the time it was first offered. They are in use in all the large eastern cities, and in San Francisco, Denver, St. Louis, Chicago and Mexico. The spring suspension is remarkably easy, and for runabout work, either for business or pleasure, it gives excellent satisfaction. The finish is in dark shades of green and black, and the structure, although light, is amply strong for all ordinary service. A buggy top may be furnished, although not supplied as standard. The mileage capacity is twenty-six on one charge of the batteries, and its speed up to thirteen and one-half miles per hour.



A Pioneer Electric Trap.



Mark XII. Runabout.



Mark XII. Victoria.



Electric Cab.

The Electrical Age.

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Newton Harrison, E. E., Editor.
Walter Mueller, Managing Editor.
ASSOCIATE EDITORS.
Electric Light and Power.
Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.
Electro-Therapeutics.
Joseph Muir, M. D.
Frederick Strange Kolle, M. D.

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KEEPING PACE WITH THE AUTOMOBILE.

The automobile industry has developed so enormously within the last few years that we have found it necessary, in order to adequately describe and illustrate some of the types best known to the public, to increase the dimensions of our special automobile issue to its present proportions. As a fast bicycle rider requires pacing by an automobile, so have we, in a sense, realized that the electrical fraternity can do no better than follow the lead of the same machine. The surface has only been scratched so far as regards the application of this new type of vehicle, and it has become absolutely necessary for up-to-date journals, related in any manner to this field of work, to devote particular attention to the industry. We hope our readers will appreciate the change we have made, and we will not fail on the publication of this issue to tie a large basket to the doors of The Electrical Age offices to hold letters of congratulation.

From a purely speculative standpoint it seems evident that the automobile industry will some day attain such dimensions that the demand for many purposes will far exceed the supply. At present, however, the automobile industry is in a comparatively undeveloped state, and while in this condition the horse and wagon will still have a chance to earn a living wage. But that day is slowly but surely passing, and at present in the streets of New York, particularly in the down-town district, the automobile has become a familiar feature of the city's landscape and is regarded now with the same unconcern as the corner letter box or the electric light.

There are many farmhouses within a stone's throw of our largest cities in which the most primitive means are adopted to perform the duties of daily life. The candle is still in use; the open fireplace remains, and the well from which the water is drawn may still be found where first dug. The thrifty and saving disposition of the farmer is opposed to the so-called "new-fangled notions of city folks," and they of all will be the last to respond to the influence of any great change in the means of transportation. Although the farmer represents the conservative element in this country, still it must be remembered that he is the one who buys the latest types of plows, and the most recent inventions in the line of reaping, mowing and thrashing machines are largely sought for by him. Why? Because the farmer represents the common-sense element and his logic is just as good and his reason as clear when a money-saving proposition is presented to him as that of the most able and successful of business men. If the farming element, which owns the majority of horse-driven vehicles, regard the automobile in some of its varied forms as a natural, useful and necessary accessory to a modern farming equipment, they of all will be the last to reject it and possibly among the first to give it a trial.

The general public, those of wealth and fashion particularly, may take an interest in the automobile, apart from the advantages, in a financial sense, resulting from its use. Yet it would be other than human nature for them not to pay some attention to the cost, the care and the durability of the automobile. Quoting from a contemporary we find the following facts, and they seem to indicate a fair and practical knowledge of the situation: "The first cost of an electric hansom, such as are now in use, is $1,800, a difference in the first cost of $600 in favor of the horse. To keep a horse, as kept in livery stables or by private owners, will not exceed fifty cents a day. The leading hack stables place the cost of keeping the horse, shoeing, and repairing the harness at $250 a year, or about sixty-eight cents a day. A large manufacturer, who keeps two teams and makes his stable account a separate item, finds the average for five years to be $400 per year for the four horses, $100 of which is for shoeing and $300 for feed, and his horses are noted for being kept in the best possible condition. In the case of the electric hansom, considering renewals, etc., makes an aggregate for the first year of $2,400, as against $1,150 for the two-wheeled hansom, a difference of $1,350 in favor of the horse." Repairs the second year are certainly less but more expensive and difficult to keep in order than the horse and carriage, but although accidents are apt to happen to automobiles as well as horses, still the automobile is not apt to drop dead in the streets, to take fright or be indisposed. An automobile has a certain intrinsic value and its years of usefulness are unmeasured. The horse, on the other hand, is regularly inspected by a veterinary surgeon: if cared for and groomed and if its food be considered, it will certainly represent in the end an expense so much greater, in connection with the price of a well-made carriage, than the automobile that little doubt remains as to the ultimate result in pracice. The automobile has come to stay and will certainly find its place a permanent one with the leading and useful inventions of the age.

MARK XII.—COLUMBIA VICTORIA.

The graceful lines and light running qualities of this little vehicle have made it an especial favorite. In Newport during the past two seasons some thirty of these Victorias have been in constant use by the cottage people. The main side panel is finished in automobile red, the battery compartment being black. The rich coloring, together with the curved dash and the comfortable upholstery, appeal especially to women, and many of the well known lady "chauffeurs" of New York, Philadelphia and Washington have acquired remarkable skill in using these Victorias. It can be furnished with a hood or English canopy top, as an extra, when specified. The long wheel base and easy spring suspension are noteworthy features. Its milage capacity on one charge is twenty-six, and it gives speeds up to thirteen and one-half miles per hour.

MARK XIX.—COLUMBIA REAR BOOT VICTORIA.

This is one of the latest styles offered by the Electric Vehicle Company. It is pre-eminently an automobile de luxe. The rear seat provides room for a driver and a "tiger," while the broad passenger seat gives comfortable room for two occupants. The upper panel in the seat is finished in light yellow French cane work, and the lower panel in a dark green, and a remarkably smart effect is the result. The milage capacity on one charge of the batteries is twenty-five. The speeds are three, six and twelve miles per hour.

MARK XIX.—COLUMBIA CABRIOLET.

This automobile follows the general lines of the comfortable horse-drawn vehicles of this style, which are so largely used in Paris, and in recent years have become so popular for calling and general driving in this country. Like the Victoria, its springs are remarkably easy, and the upholstery of the most luxurious type. Dark and light greens are the prevailing colors in its finish, and there is room for a third passenger besides the driver and attendant. On one charge of the batteries its capacity is twenty-five miles, and its speed is twelve miles per hour.

MARK XIX.—COLUMBIA SURREY.

This is also one of the most recent productions of the Electric Vehicle Company, although a few have been in use since the latter part of August. It comfortably accommodates four occupants, and can be equipped, when specified, as an extra, with a canopy top. The finish is in dark greens, with a panel of French cane work on the sides over the rear wheels. For country work or general pleasure riding, this vehicle is as satisfactory in its service as it is smart in it appearance. Its mileage capacity on one charge of the batteries is twenty-five. Its speeds are three, six and twelve miles per hour.

MARK VIII.—COLUMBIA GASOLENE RUNABOUT.

For long distance work or cross-country touring, the gasolene vehicle has already been proved in France to be unsurpassed. It is rapidly being accepted as such in this country. With a vehicle like the one shown in the cut, one can go over one hundred miles without replenishing the gasolene tank or stopping to take on water. A speed as high as twenty-five miles per hour may be attained and it can climb grades as steep as twenty-five per cent. It carries two passengers with comfort, and provides space under the seat for their baggage.

MARK XVI.—COLUMBIA BROUGHAMS.

These vehicles are built with straight fronts and with extension fronts. The former style accommodates two passengers, the latter style four, in addition to the driver and attendant on the front seat in each case. They are designed pre-eminently for city work in both public and private service, and have become a familiar sight in Boston, New York, Philadelphia, Washington and Chicago, as well as in other cities where the Electric Vehicle Company has established its operating companies. For theatre service, for calling, for physician's work, they are largely used. They attain a speed of eleven miles an hour and the mileage capacity is twenty-five on one charge.



Riker Electric Surrey. (See page 147.)

MARK XVII.—COLUMBIA HANSOM.

This is one of the earliest types of public automobile vehicles put on the market by the Electric Vehicle Company, and was the first to become a familiar sight in the streets of our large cities. It has the well known advantages of the horse-drawn hansom, with the added one of having the view from the front of the vehicle entirely unobstructed. It is in steady demand for all public vehicle purposes, and more than three hundred are in use. It has a mileage capacity of twenty-five, and attains a speed of eleven miles an hour.

MARK XI.—COLUMBIA SIX-PASSENGER OMNIBUS.

This automobile was designed especially as an opera bus, and as such has been very well received. Among the many automobiles shown by the Electric Vehicle Company at the Paris 1900 Exposition, this was the subject of especially favorable comment. It will be recalled that the Electric Vehicle Company was placed "hors

Concours" at Paris on account of its representative being one of the members of the jury. A similar honor was accorded only to one or two of the leading French manufacturers. Its mileage on one charge is twenty-five and its speed ten miles an hour.

MARK XI.—COLUMBIA EIGHT PASSENGER OMNIBUS.

To visitors at Atlantic City, and in Washington, where these vehicles were first introduced, they have become a common sight. The leading hotels in both of the places mentioned adopted them in the spring of 1900 for station service, and they have continued regularly in this work. They will accommodate eight passengers or more, and are provided with railings (not shown in the cut) on the top for the accommodation of light luggage. On one charge of the batteries its capacity is twenty-five miles, with a speed of ten miles an hour.

MARK XI.—COLUMBIA WAGONETTE.

This is the largest automobile, as regards passenger carrying capacity, which has yet been placed on the market in numbers, as a standard vehicle, by any automobile firm. It takes eleven people besides the driver, without any crowding. For public service and pleasure excursions of any nature, they are largely used, and are also giving excellent satisfaction in the former class of work in different cities, notably Chicago. One charge suffices for twenty-five miles, and a speed of ten miles an hour can be attained.

florists, laundries and other establishments dealing in merchandise of similar character. Like all the Electric Vehicle Company's delivery wagons, it is finished in shades to suit the individual tastes of purchasers, and while the design is elegant it is built primarily for hard usage, and to work under the trying conditions of delivery service. It is good for a mileage on one charge of the batteries of twenty-five, and its highest speed is eleven miles per hour.

MARK XI.—COLUMBIA DELIVERY WAGON.

This is the well known type of electric wagon turned out by the Columbia people, over ninety of which are now in use in different localities. It will carry up to 1,000 pounds of merchandise besides two occupants on the front seat. The space available for merchandise is even greater than the average department store wagon, although special bodies can be supplied on this gear, adapted for the transportation of furniture and other especially bulky merchandise of even greater capacity that the standard body. It is good for a milegae on one charge of the batteries of over twenty-five, and speeds up to eleven miles per hour.



Riker Electric Delivery Wagon.

MARK VII.—COLUMBIA GASOLENE TRICYCLE CARRIER.

This automobile, somewhat novel in its appearance, has been found to fill an especial demand for a delivery automobile capable of carrying light weights at a high speed over considerable distances. It will take merchandise up to 500 pounds, besides the driver, and can be run at a speed of over twelve miles per hour. One charge of the gasolene tank suffices for seventy-five miles, and the water tank needs refilling after each run of twenty. This vehicle can also be equipped with seats running lengthwise, thereby transforming it into a species of jaunting car. It is claimed to be the simplest and most economical gasolene delivery automobile now on the market.

MARK XIX.—COLUMBIA DELIVERY WAGON.

This little electric wagon has been only recently offered. It will carry a load of 600 pounds besides the driver and attendant, and has ample bulk capacity for

These vehicles are manufactured by the Electric Vehicle Company, of 100 Broadway, New York city, and Hartford, Conn.

THE RIKER ELECTRIC VEHICLE COMPANY.

The Riker Electric Vehicle Company, of Elizabethport, N. J., are the manufacturers of a line of electric and mechanical vehicles second to none in the world. Their elegance of construction, high efficiency, smoothness of operation and general reliability has secured a reputation for the builders which has created an enormous demand for them all over the world. The plant, which is situated at Third and Pine streets, Elizabethport, N. J., occupies a surface area of 200x600 feet, a square block, and includes the various departments of a thoroughly equipped and up-to-date automobile works.

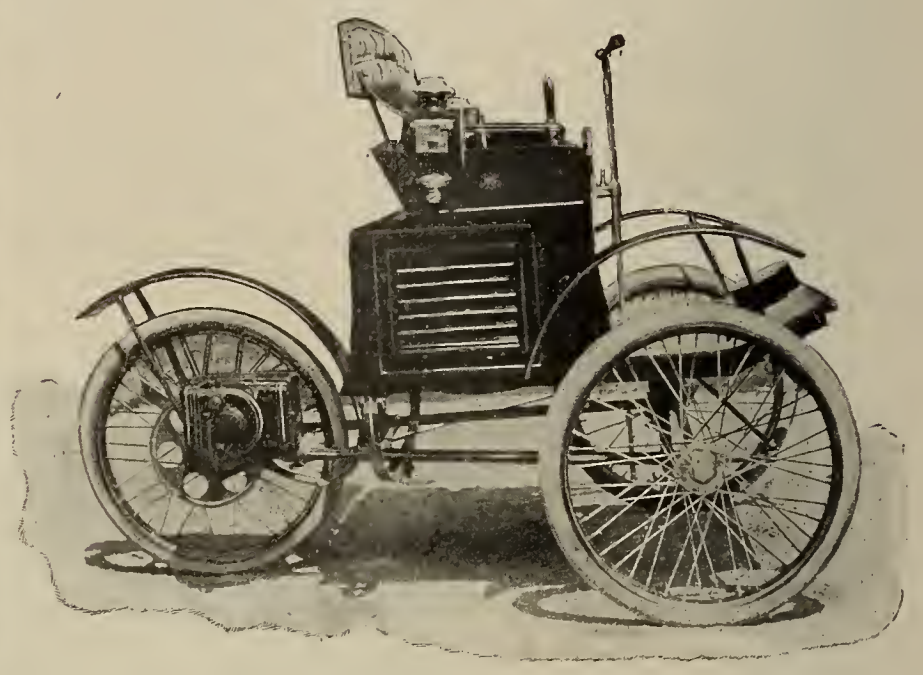
The electric surrey, brougham, dos-a-dos and demi-coach are a few of the types of vehicles turned out by this company. The Riker electric surrey has a tread of 56 inches, a weight of 2,700 pounds and a carrying capacity of from four to five persons, is driven by a two K. W.

motor at a maximum speed of sixteen miles an hour. The total mileage on level asphalt is about 25 miles. The controller gives four speeds forward and two speeds to the rear. The electric brougham has a weight of 4,000 pounds and a carrying capacity of two people in addition to the operator and attendant. It is driven by two motors of two K. W. capacity each and attains a maximum speed of 10 miles an hour but can cover twenty-two backward. All of these vehicles are supplied with a combination volt and ammeter. The driving is from the rear wheels and the steering from the front wheels. In addition each is equipped with electric side lights.

The careful testing through which each vehicle is put before being considered ready for shipment has been the means of making each vehicle operate from the very start with the greatest satisfaction to purchasers. The



Riker Electric Brougham.



Riker Electric Tricycle.



Riker Electric Phaeton.



Riker Elec ric Truck.

five miles as above described, the controller giving two speeds ahead and two in the rear. Dos-a-dos has a total weight of 2,500 pounds and can carry four people. It s driven by a two K. W. motor and attains a speed of twelve miles an hour. With a charge of the battery it will run twenty-five miles on a smooth, level road. The controller in this case gives three speeds forward and

future history of an automobile, as far as durability is concerned, depends largely upon the care with which the machine is assembled, and for this reason the most skilled mechanics are employed in fitting together the various parts of the vehicle which lead to easy running and efficient operation.

Their very extensive plant is fitted with all the modern machinery for making all their own bodies for every line

of vehicles including delivery wagons like those furnished to the Gorham Mfg. Co., Altman & Co., Hearn & Son., L. S. Plaut & Co. (of Newark, N. J.), also mineral water wagons such as furnished to C. H. Schultz, of N. Y.

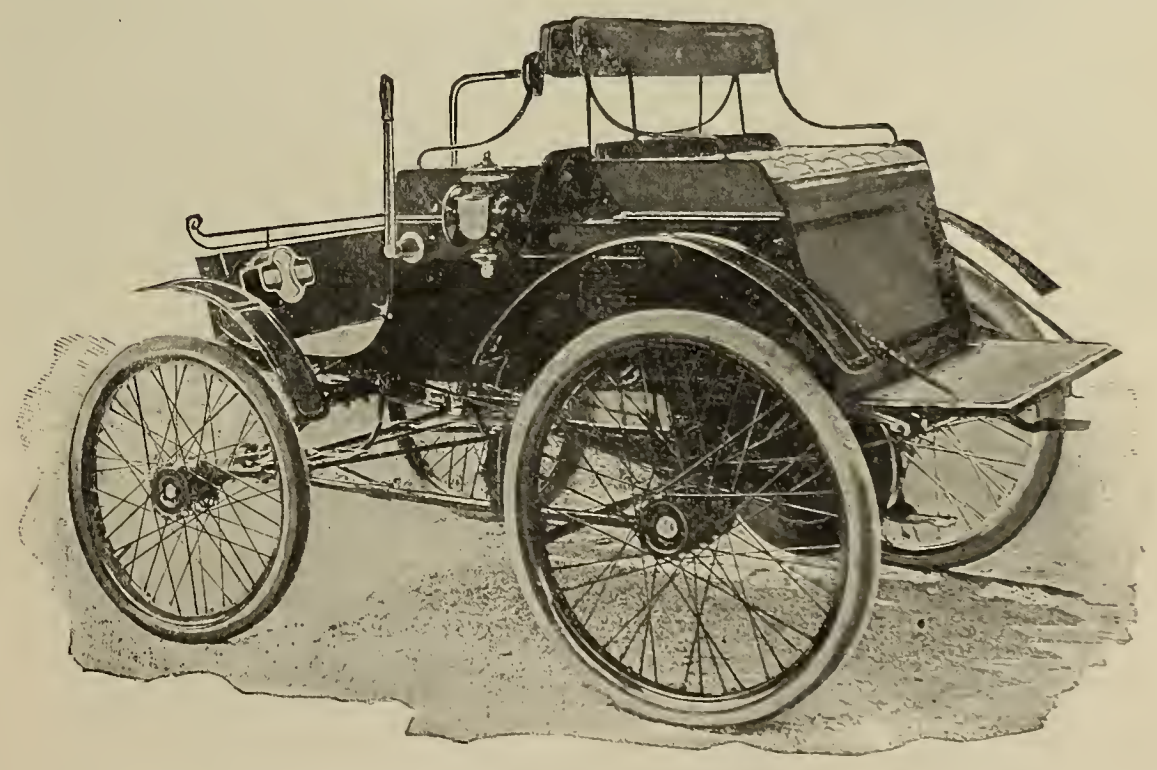
The Riker Electric Motor Company was originally organized in New York in 1888. The plant was ultimately moved to Brooklyn and business so improved that in 1899 the present plant in Elizabethport, N. J., was purchased. In May, 1899, the Riker Electric Vehicle Company was organized and purchased the works which they now occupy, and has become one of the greatest establishments of its kind in the United States. The officers of the company are F. C. Stevens, president, who is also president of the West End National Bank, of Washington, D. C.; A. L. Riker, chief engineer, and E. Lavens, general superintendent.



Riker Electric Two Passenger Trap.

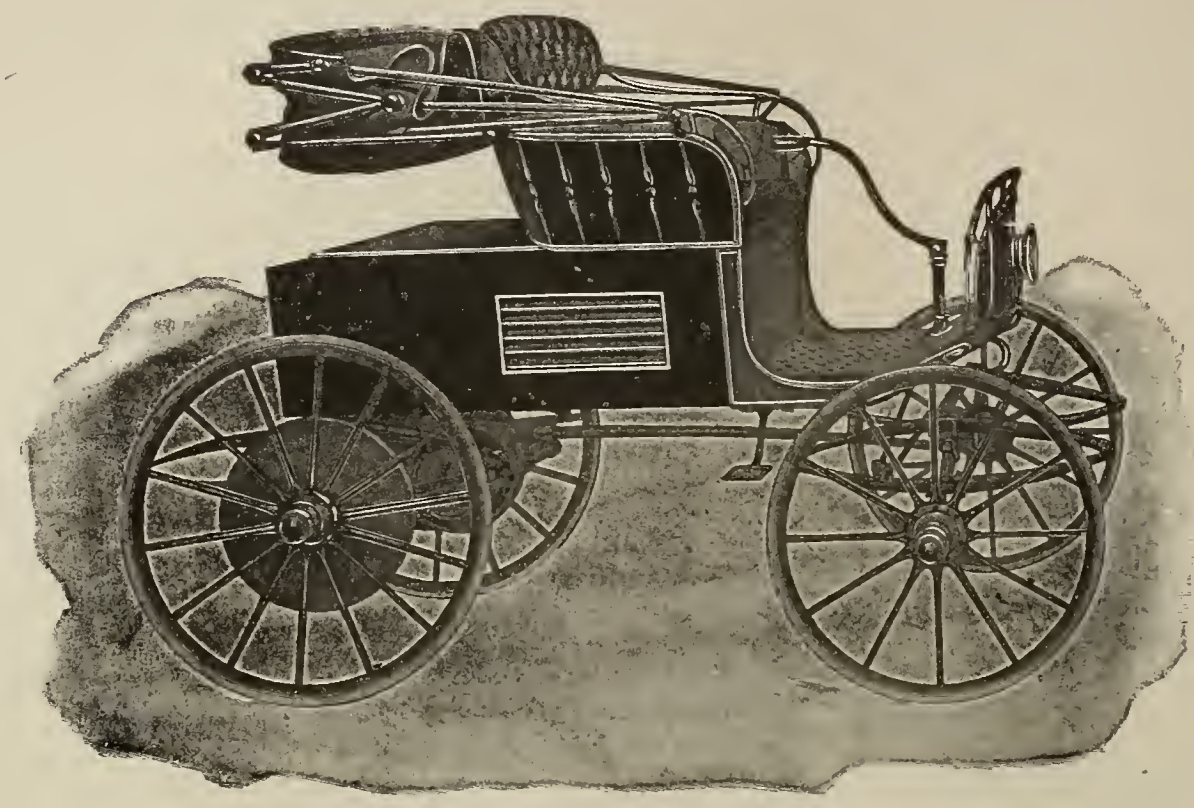
AMERICAN ELECTRIC VEHICLE COMPANY.

At the Automobile Show vehicles that will excite deep interest and attention are those manufactured by the American Electric Vehicle Company, 134 West 34th street, New York. At their booth may be seen the three carriages, illustrations of which grace this article. The first, an American runabout buggy, is the picture of lightness, combined with strength and speed. This buggy was tested by Mr. G. W. Knox, chief engineer of the Chicago City Railway, and he found that the maximum current used, when the wind was strongest, was only eighteen amperes, and that used under ordinary conditions about twelve. The weight of the runabout complete is between eleven and twelve hundred pounds, and at the above test grades were encountered varying from one and a half to three per cent. and various roads



Riker Electric Four Passenger Trap.

of the nature of asphalt, macadam, granite and even wood. After covering a distance of sixty-one and a half miles a depreciation of speed was noticed of not more than twenty-five per cent. In many respects this carriage is the ideal of automobilists, and its lightness, beauty of finish, high attainable speed, and simple control brought it into great prominence during the show. The cost of running is about one cent a mile, and by means of a combination meter the operator can keep track of the capacity of the cells as the journey progresses. The motors used by this company are of the single reduction type, armature shaft hollow, and one motor in use for each vehicle. These motors are so constructed as to combine with their water and dust proof qualities compactness and an attractive appearance. The band brakes with which these vehicles are supplied are controlled by a foot lever which will hold the carriage in a fixed position on any grade, ascending, descending, or at any speed. The speed is under absolute control through the medium of a lever held in the operator's left hand. In addition the steering lever, held in the right hand, will, with the slightest effort applied to it, move the vehicle to any point intended. Through the aid of differential gearing the turning of corners is accomplished with ease and celerity. Reversing is a simple process likewise; a small lever at the driver's seat is given a

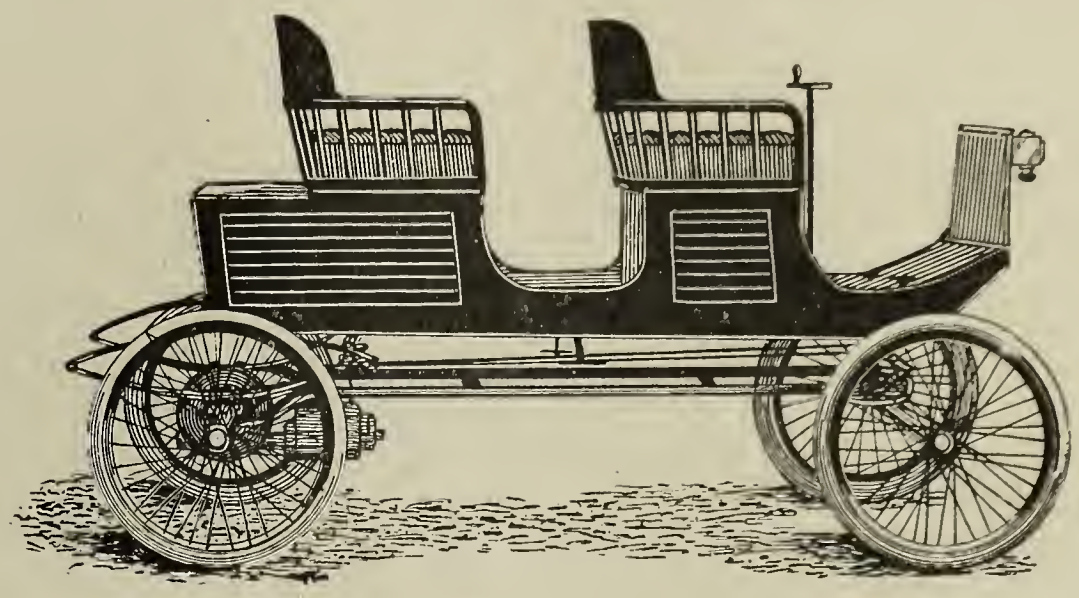


American Runabout.



American Delivery Wagon.

touch and backward motion is immediately possible. In addition to these features, which add to the ease and comfort of travel, are electric lights which show the way in the darkest night, thereby supplying within a closed vehicle the equivalent of a comfortable and well lighted apartment. The cost of these vehicles is very moderate. Unusually so, in fact, when the high quality of the material and workmanship is carefully examined. In other illustrations are shown the American delivery wagon and the American brake, of the same fine finish and excellent



The 'Bradbury

design as the runabout. For all high-class stores, run by up-to-date, progressive business men, the electric delivery wagon is certainly an advantage whose value will become more widely understood as time rolls on. For quickness of delivery and readiness at all times these wagons are without doubt types par excellence. The



American Brake.

weary horse is shelved and in snowy or sleety weather there is nothing to slip down and delay the delivery of packages. Finally the pleasure vehicle illustrated possesses the same general features of design as the others, but is particularly adapted for quick runs with a large party and for country roads, parks and boulevards. The government of this vehicle is as quickly learned as that of the preceding type, differing in no respect and fulfilling its functions in as admirable a manner.

THE POMEROY ELECTRIC VEHICLE.

An entirely new type of vehicle, to be propelled by power from a new Plante type of storage battery, is in course of construction by The Pomeroy Electric Vehicle Company, of 239 Willoughby street, Brooklyn, N. Y. This new type of electric vehicle is the invention of Mr. B. H. Pomeroy, the electrical engineer, assisted by Mr. Robert W. Brodmann, electrician. The above company has been organized for the purpose of manufacturing the above vehicles and storage batteries. They will be made in every style and shape required and for all purposes. The two main features of this system are the direct action of an electric motor with a worm gear upon the rear axle of the vehicle and the perfect flexibility of the frame of the same. Mr. Pomeroy invented and designed this system several years ago. Among the main features of the system, which are all patented, is the application of two pedals in the front part of the vehicle, to be operated from the front seat. One pedal is used for applying the brake, the other for starting, stopping and reversing the vehicle with one or both feet. A hand wheel, shown at the front seat of the vehicle, is used for steering. The braces shown under the body of the vehicle are composed of steel tubing and connected as shown in the illustration. The front section of the tubes is

fastened to a socket resting on ballbearings, making a perfect ball and socket joint, which gives great flexibility to the vehicle as well as the motor resting on the rear of this frame. The motor is of a special type, direct connected to the rear axle by a worm gear, which runs in oil, as shown in the illustration. The motor is constructed to run continuously while in action at its highest speed, thereby saving in current when starting, stopping or reversing. The motor is also out of action when going down hill. This system, as described, is the most flexible extant and will be made attachable to all present styles of vehicles with very little alterations. The Pomeroy Company's new storage battery will be compact, light and very economical, guaranteeing 50 ampere hours to every pound of composition. The vehicle illustrated with this article will be designated the "Bradbury" after Freeborn G. Smith, the great philanthropist of Brooklyn and maker of the noted "Bradbury" pianos.



The Perret Electric Vehicle.

THE PERRET AUTOMOBILE AND BATTERY.

In 1896 Mr. A. Frank Perret built an automobile to carry five persons, using as a source of motive power the electric storage battery. This vehicle was completed and was operated in a most satisfactory manner, but, in common with nearly all other automobiles of similar carrying capacity and mileage, required a great weight of battery, about 1,200 pounds. This, of course, necessitated the use of very substantial materials in the construction of the vehicle itself, making the total weight quite considerable. This disadvantage, coupled with the various troubles arising from the best batteries he could obtain and their limitations of output and current, led him to the construction of a type of storage battery which should in itself combine lightness in weight, high rate of charge and discharge, long life and freedom from buckling. Briefly, this is a lead and sulphuric acid type of cell, with Plante element, and in its manufacture nothing is used to cause chemical or electrical troubles in the course of its natural life. Its capacity is stated to be over 14 watt hours per pound of complete cell (including acid), at a discharge rate of 1 ampere per pound. This discharge rate may be greatly exceeded without in any way injuring the cell, but, as is the case with all batteries, it is not advisable to prolong high discharges. The charging may be accomplished much more rapidly than is usually the case.

To make a practical road test of the battery in order to ascertain its real merits as a source of motive power for automobiles, the Perret Storage Battery Co., 21 State street, New York, decided to build a light vehicle in which should also be included some of Mr. Perret's inventions in these vehicles, which is shown in the accompanying illustration. The vehicle complete, with battery, weighs about 440 pounds, but this weight could be reduced in a future similar carriage. It is well and sub-

stantially built, and, while it is only a one-man vehicle, it will carry with each a person weighing 250 pounds. The truck is made of steel in the form of two triangles connected in the centre by a horizontal king-bolt, to give absolute flexibility to the truck. The reaches terminate at the hubs of the wheels, thereby transmitting all strains in proper directions and eliminating the possibility of breaking of the axles in consequence of any collision. The wheels are 28 inches in diameter and have ball bearings.

This automobile is unique in being operated by a worm gear, which renders it absolutely noiseless. This gear is of a special design, giving a high efficiency. The motor is suspended on the rear triangle of the truck and is directly coupled to the worm shaft.

Another special feature of this vehicle is the controller, which is so arranged that speed changes are effected by means of a divided motor field. Several advantages arise from this method of control, among them being the easily obtained variation of speed, the compactness and positive action of the controller itself, the ability to always discharge all the cells of the battery in series. No multiple series grouping is necessary, and the cells can also be charged in series, without the necessity of making any complicated connections, before throwing on the charging circuit. The controller itself is very compact, being only about six inches in diameter and three inches in depth. It is operated in the usual way by a lever which is connected to the controller by a crank carrying an appliance for reversing the polarity of the current. By means of this arrangement the same set of contacts on the controller are put in use, whether the vehicle is running forward or backward, thus ensuring great simplicity of operation and a minimum of contact points. The steering is accomplished in the usual manner by pivoted hubs operated by crank levers connected to the steering handle.

One hundred and seventy-five pounds of battery is used to operate this automobile, and one charge will run it about 40 miles over moderately good roads, at an average speed of 13 miles an hour. This little vehicle, of course, is simply intended to demonstrate Mr. Perret's inventions in the line of the storage battery and the improvements in the automobile itself. It is not expected that this vehicle will itself be a type that will come into extensive use, though there are many who will desire automobiles of this kind for special purposes. What has been demonstrated in this vehicle is the ability to build others of greater carrying capacity that will be very much less in total weight than many now on the market, and embodying strength, flexibility and simplicity of operation.

CANDA MOTOR VEHICLES.

The auto-quadricycle, manufactured by the Canda Manufacturing Co., is a four wheel vehicle propelled by a gasoline engine mounted over the rear axle. The engravings show its general features and arrangement. The principal features are that it is simple and light, readily managed, easily understood, convenient and safe, strongly built and durable. All parts are interchangeable and easily accessible for inspection, adjustment and repair. It carries two persons tandem, one in front upon a seat like that of a buggy, and the other upon a saddle in the rear.



The Auto-Quadricycle.

The motive power is a gasoline engine of the Otto type, mounted over the rear axle. When running at the normal speed it will develop about 1 3-4 horse-power. The gasoline engine has proved itself to be the most reliable, economical and easiest handled of all the methods proposed for propelling light motor carriages. It is ready for use at a moment's notice. Its fuel (gsaoline) is in universal use and can be obtained at any country store.

The speed has a range of from 2 1-2 to 25 miles per hour.

The auto-quadricycle van is a light vehicle, very convenient for making deliveries of light parcels, or it may be used by traveling salesmen.

The spider runabout is, as it name indicates, a light pleasure vehicle well suited for park, suburban and country service. Its light and graceful lines make it a favorite with those who wish a stylish turnout. The low step and the wide space between the wheels make this vehicle very easy to enter. In this respect it is especially convenient for ladies.

The Stanhope is a stylish carriage especially adapted

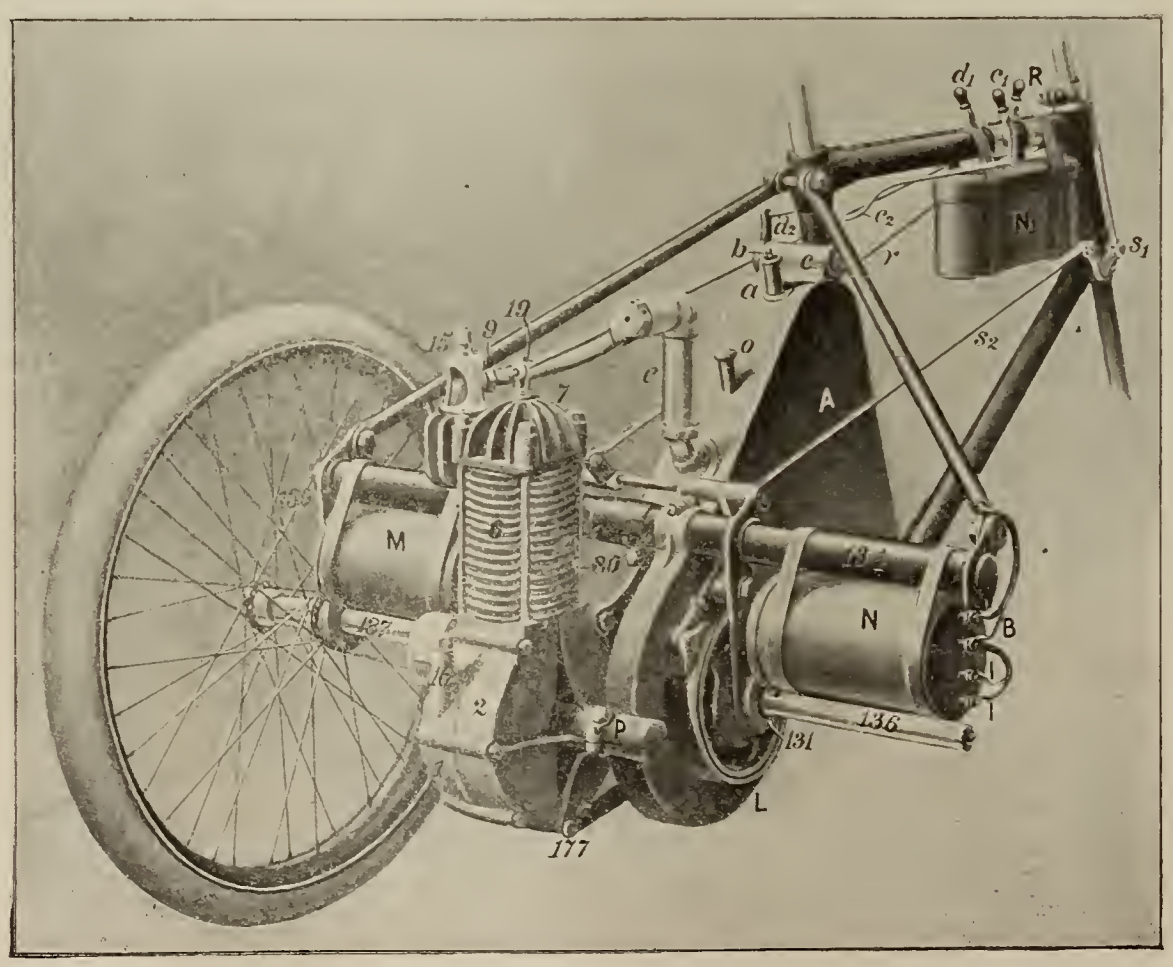
to general pleasure service. At the same time it is well suited to light service in crowded streets, or for making high speed in the country over long distances. Although essentially a pleasure vehicle, it is almost an ideal "rig" for a physician or for any one whose business requires him to ride a great deal.



The Auto-Quadricycle Van.

Both vehicles are driven by a pair of gasoline engines of about 2 1-2 horse-power each, similar to those used on the auto quadricyle, the only differences being such as are necessary in coupling two engines together. The two cylinders are fed from a single gasoline tank and have a single carbureter. An advantage is obtained by using two cylinders or a double engine arranged so as to balance each other, thereby greatly reducing the vibration.

In the Spider speed regulation is obtained by adjusting the supply of air and gasoline vapor. The range thus obtained with the Canda Company's standard gearing is from 3 to 10 miles per hour.



The Machinery of the Auto-Quadricycle, seen from the Rear. One Driving Wheel Removed.

The Stanhope is provided with a variable speed me-

chanism which permits the engine to run regularly at its most economical rate, while the carriage may be made to move at any desired speed from a moderate walk, say 2 1-2 miles up to 15 miles per hour. This mechanism enables the carriage to be run backwards as well. All these variations aer obtained by simply moving a conveniently located lever. We can, if directed when the order is given, gear either machine at higher speeds.

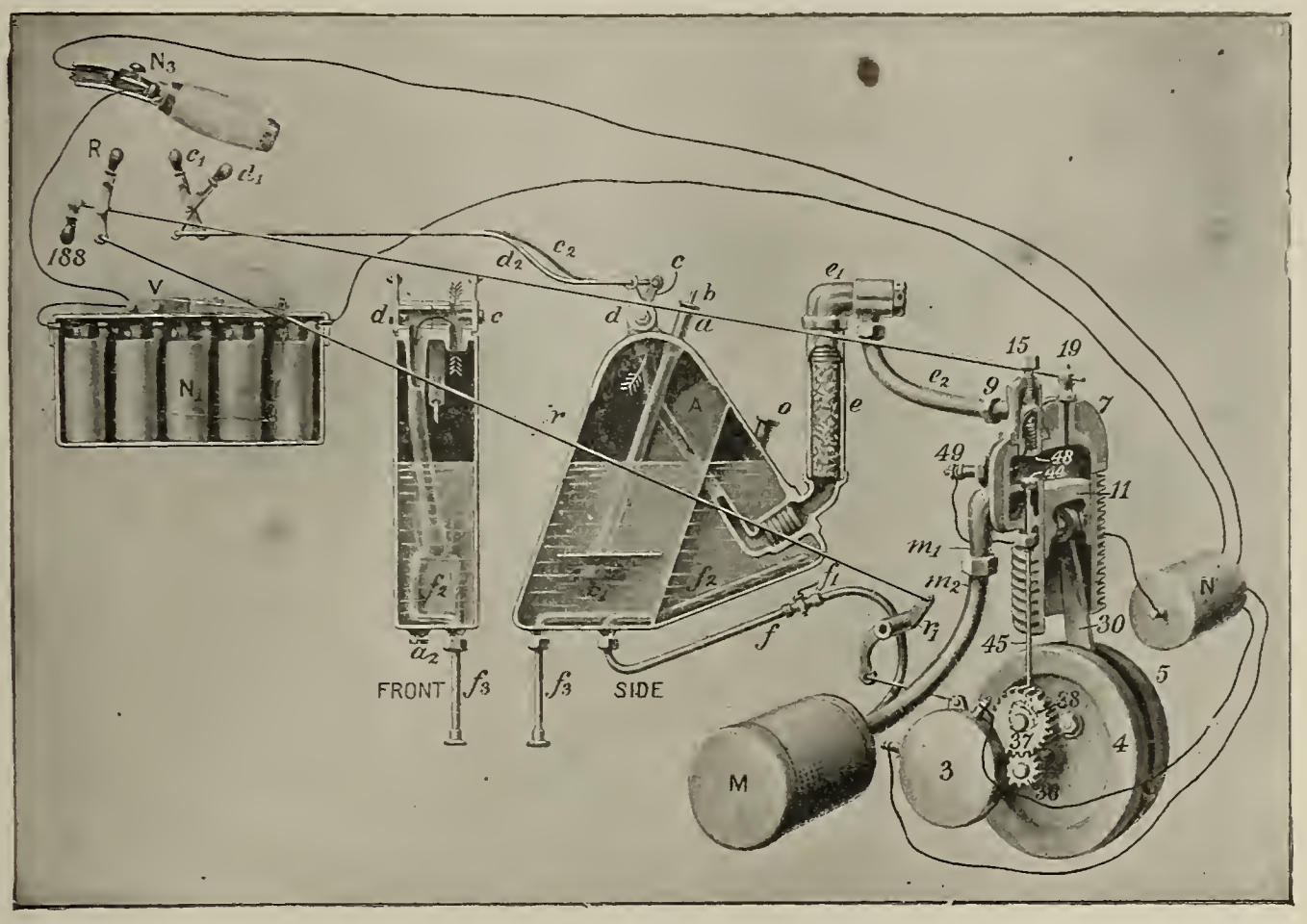
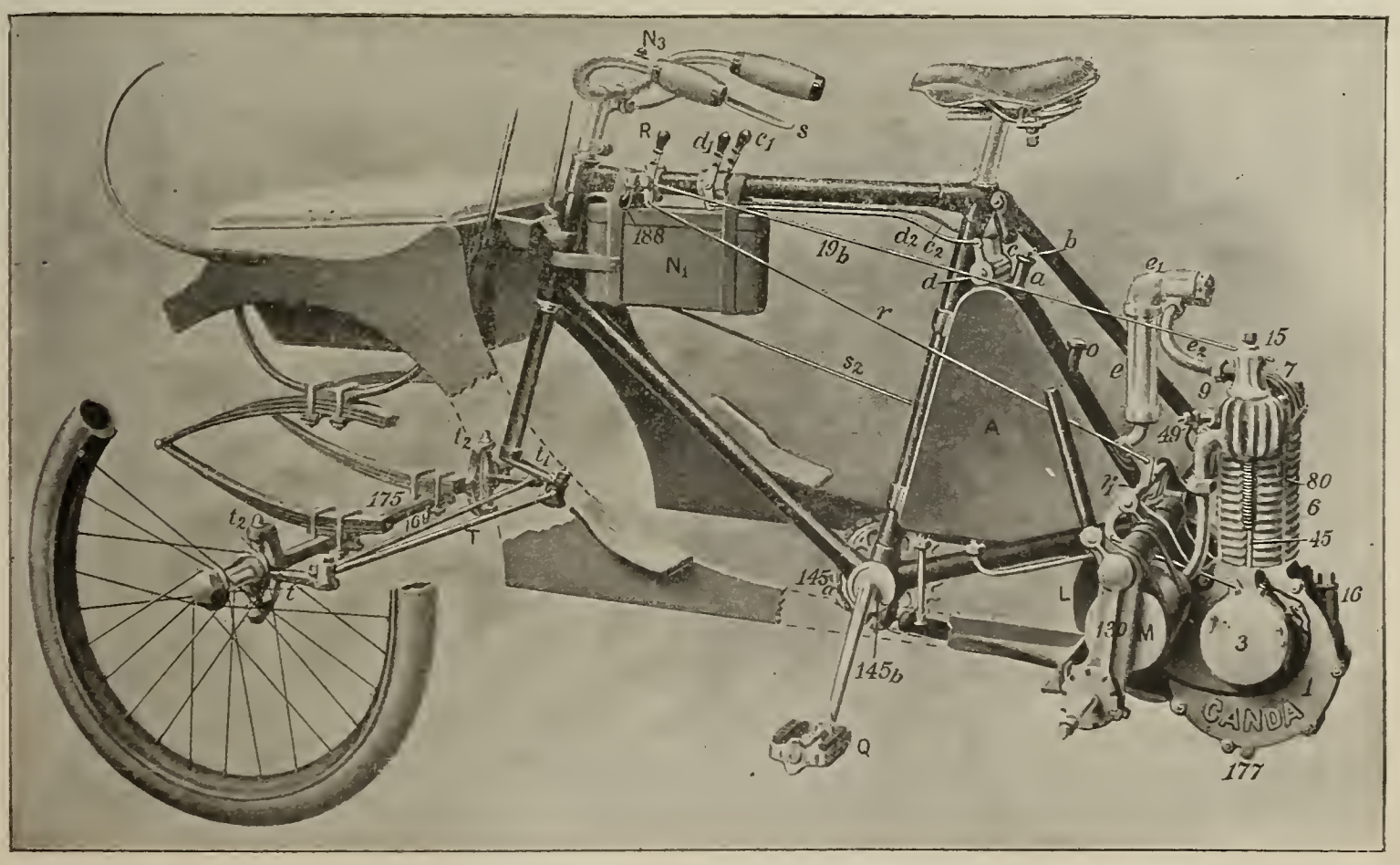


Diagram Showing Engine and the Relationship of its Parts.

All Canda vehicles have band brakes applied by the foot. These brakes are very powerful and give complete control of the carriage.

The steering is performed by a hinged lever which can be lifted up out of the way when it is desired to enter the carriage. Other regulating levers are brought to the top of a standard conveniently situated in front of the seat. The quadricycles and tricycles are each furnished with an engine of 1 3-4 horse-power.

These vehicles are manufactured by the Canda Manufacturing Company, (P. O. address) Carteret, N. J.; office and factory at Canda, on Sound Shore Branch, Central R. R. of N. J., and will be on exhibition at the Automobile Show, Madison Square Garden.



Side-View of the Machinery, Showing Details.

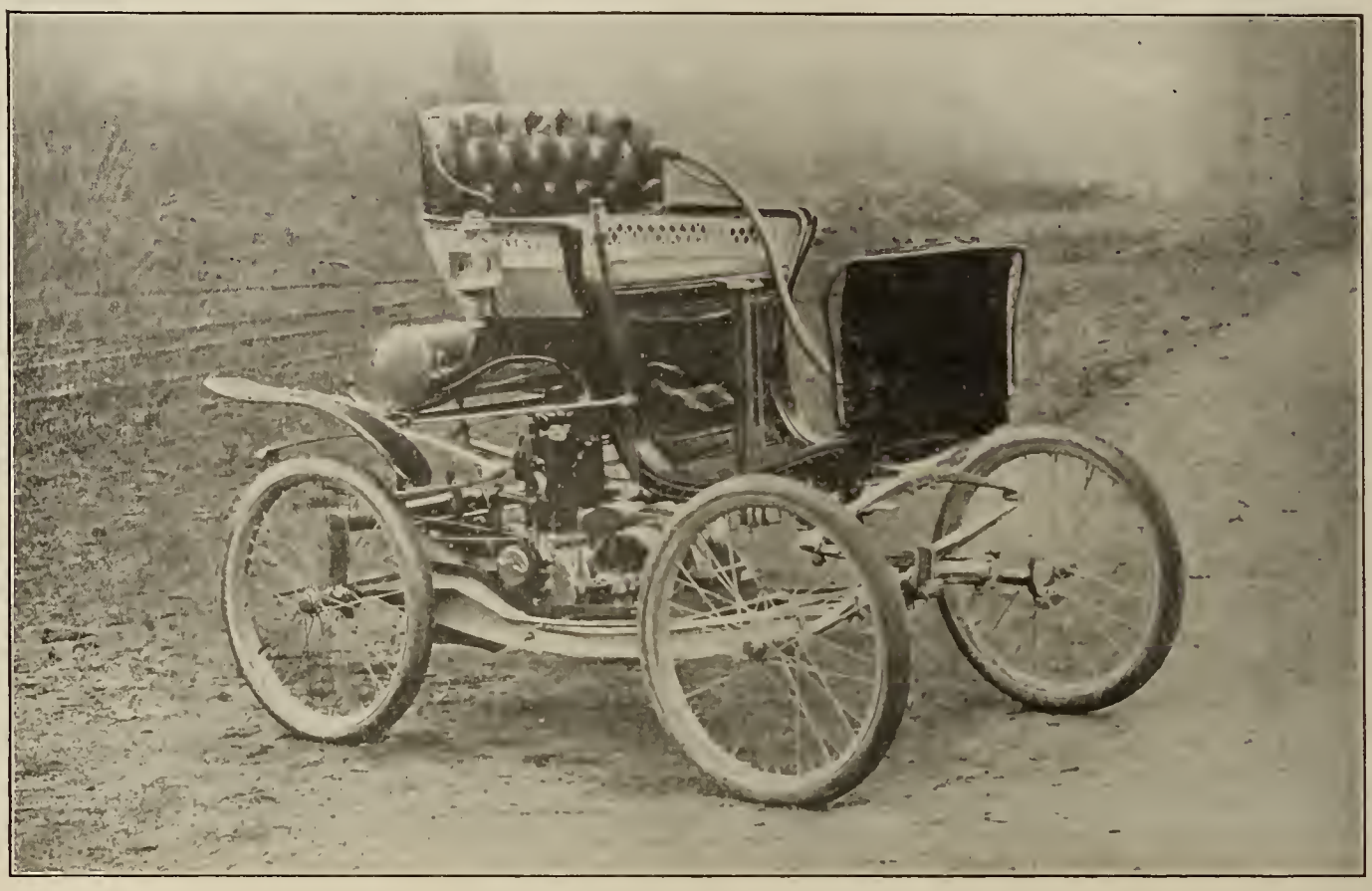
THE "VICTOR" AUTOMOBILE.

This is a steam automobile entirely automatic in feeding water and fuel from the supply tanks into the boiler and burner.

The special features are: 1. Water is fed automatically into the boiler, and its surface does not vary more than two inches from the established line which is found to give the best results. 2. The pressure on the fuel tank does not vary more than four pounds, thus insuring a steady and uniform fire under the boiler. 3. Should the water in the boiler fall, for any reason, to within two inches of the bottom, a fusible plug melts and automatically shuts off the fuel. A delay of only a few minutes is necessary for inserting a new plug and refilling the boiler. 4. Every part of the carriage is made of metal, except the seat and foot-board. 5. There is no noisy jet of exhaust steam discharged into the air. 6. With the supply tank filled, the machine has stood without attention for eight hours, and at the end of that time was then ready for instant use. 7. Water is automatically pumped into the boiler whether the carriage is in motion or standing still.

When the carriage is in use, three things only require attention: 1. Replenishing the fuel and water in the storage tanks. 2. Operating the throttle and reversing lever. 3. Steering.

With cold water in the tank, 150 pounds steam pressure in the boiler is obtained within ten minutes after lighting the fire. A double strap brake holds the carriage from either forward or backward movement. The engine is four-horse power, and the boiler capacity six-horse power. The fuel used is common gasolene, and the burner is so designed that there is no "flashing back." The fuel tank has a capacity sufficient to supply the burner while traveling a distance of from fifty to sixty

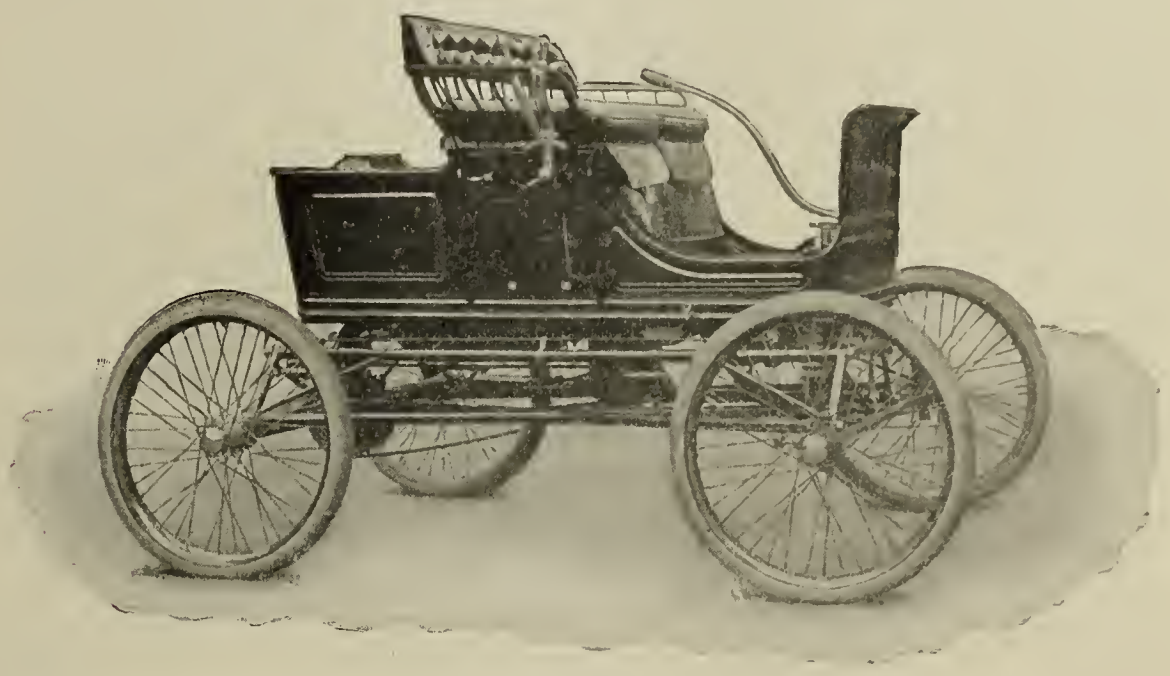


Canda Runabout. (See page 155.)



Canda Stanhope. (See page 155.)

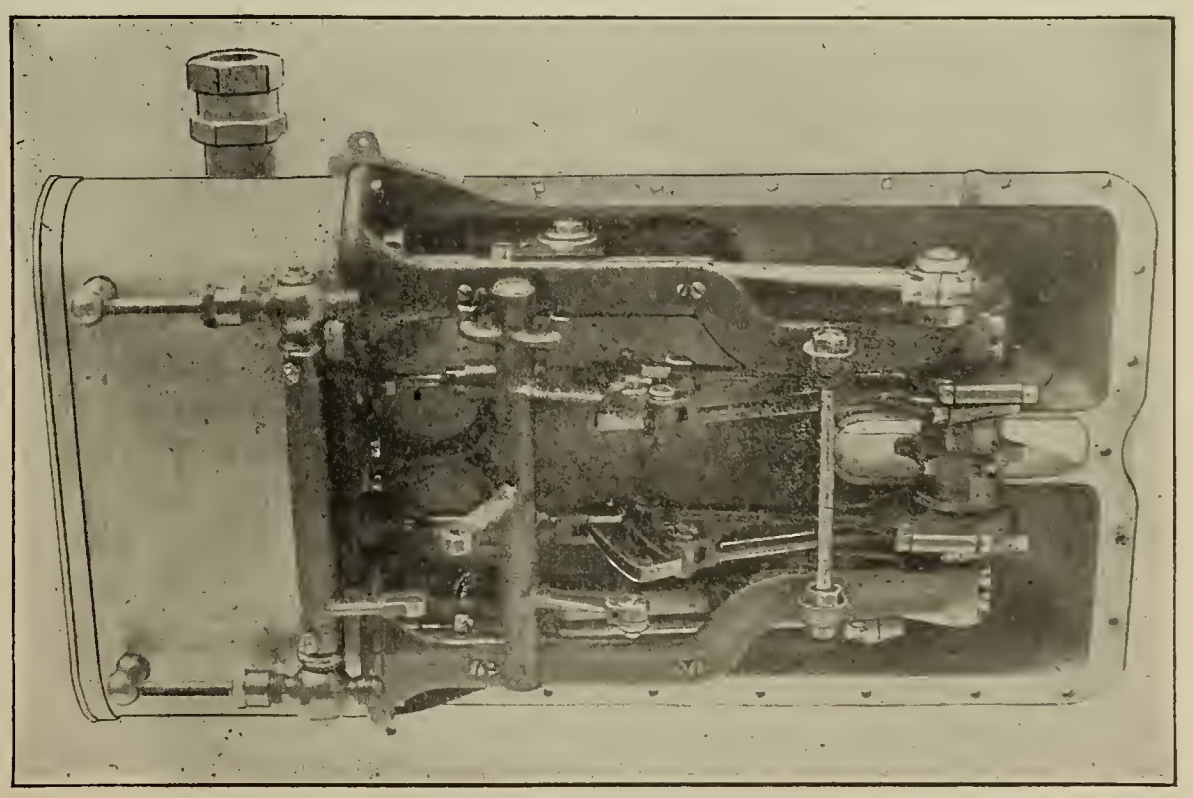
miles, and the water tank a capacity for a distance of twenty-five miles, over ordinary roads. The engine is enclosed in an aluminum box, partly filled with oil, and being thus protected from dust and dirt requires no attention. The body of the carriage is made of iron, and the frame of the running gear of steel tubes. The tubular boiler is made of steel and will be inspected and insured by the Hartford Steam Boiler Insurance Company.



Victor Automobile.

There are many other special features, the excellence of which will commend themselves to purchasers. The materials and workmanship are the best obtainable, and the greatest care is taken in construction to insure durability. Factory is now in operation, and carriages will be ready for delivery within a short time.

This vehicle is manufactured by the Overman Automobile Company; office 81 Fulton street, New York city, and factory at Chicopee Falls, Mass. The "Victor" automobile will be on exhibition at the automobile show, Madison Square Garden.



The Victor Engine.

AN ACETYLENE DRIVEN AUTOMOBILE.

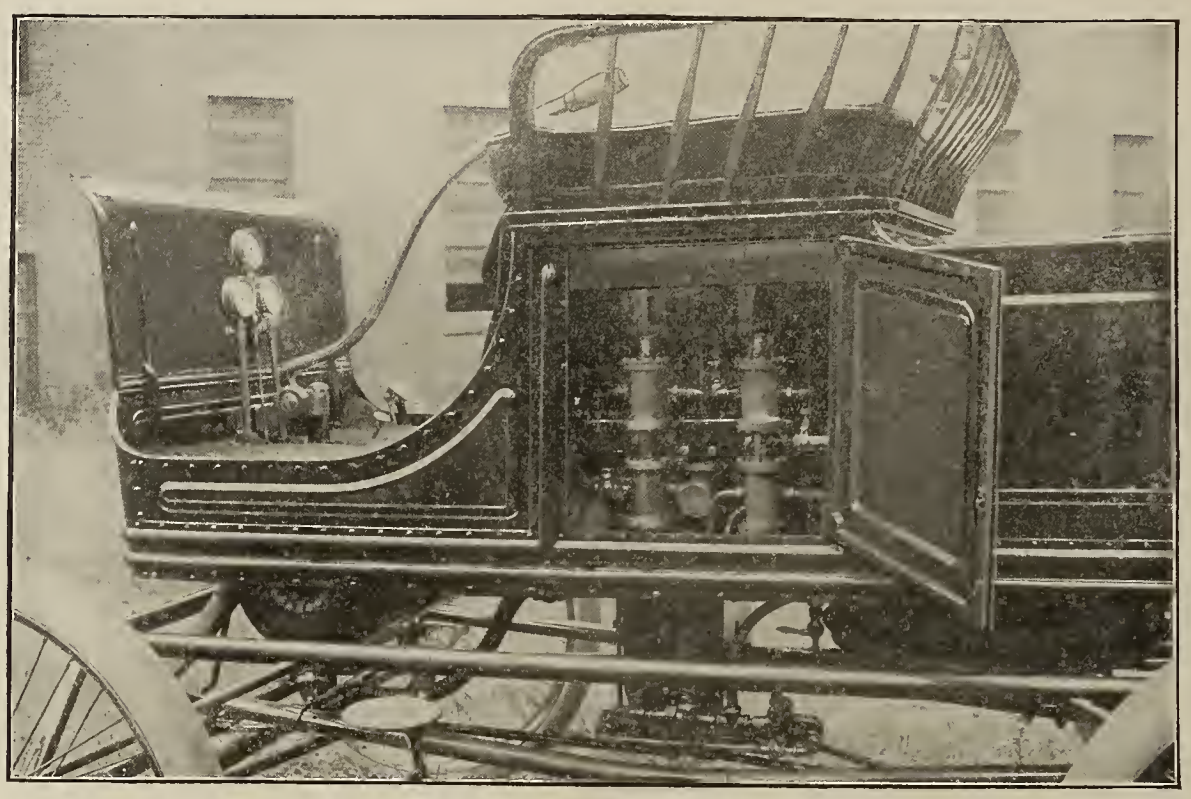
The Auto-Acetylene Company, of No. 13-21 Park Row, New York city, have been developing an automobile, and after two years' testing, modifying and perfecting the mechanism of their automobile, the company announces its intention to salute the public.

In talking with one of the officers of the company he said: "Our purpose in the market is to make a regular line of automobile wagons, and especially heavy trucks, drays, stage coaches and miners' prospecting wagons. We have a motor that works successfully. It has carried one of our wagons over the road for sixty-three hundred miles with but one accident, and the motor to-day is to all appearances as perfect as it was the first month it was in use. All we claim for our automobile is that it works successfully. We do not claim we have the only thing in existence, but we do say that we have one that is provided with a motor, carburetter, and steering apparatus that meets all of the requirements, and the machine as an

automobile is capable of going every day up and down the ordinary grades at a speed suitable for such navigation, without fear of a breakdown at every cross road. The motor runs almost as noiselessly as an electric motor, there is no odor, no danger of explosion, and the operator is not compelled to take out a license as an expert engineer in order to be allowed to manipulate our automobile, nor must he be an expert electrician. Any child of ten years of age can be taught to operate our wagon in a few hours' time, and it is as easy to start or stop it as anything of the kind possibly can be.

A feature that has always been a drawback to the gasoline driven automobile is the odor that permeates the whole structure on account of the burning gas or the volatile element of the hydrocarbon escaping through the most closely fitted valves and connections of the engine. This is a feature the Auto-Acetylene Company's expert claims to have overcome, and there is no penetrating odor escaping through the mechanism of the wagon, and therefore it is quite suitable for use as a delivery wagon where it is desired to convey goods that would be injured by absorbing the odor arising from the ordinary gasoline engine.

The miners' prospecting wagon is in reality a mining



The Victor Engine, with Side-Door Open. (See page 157.)

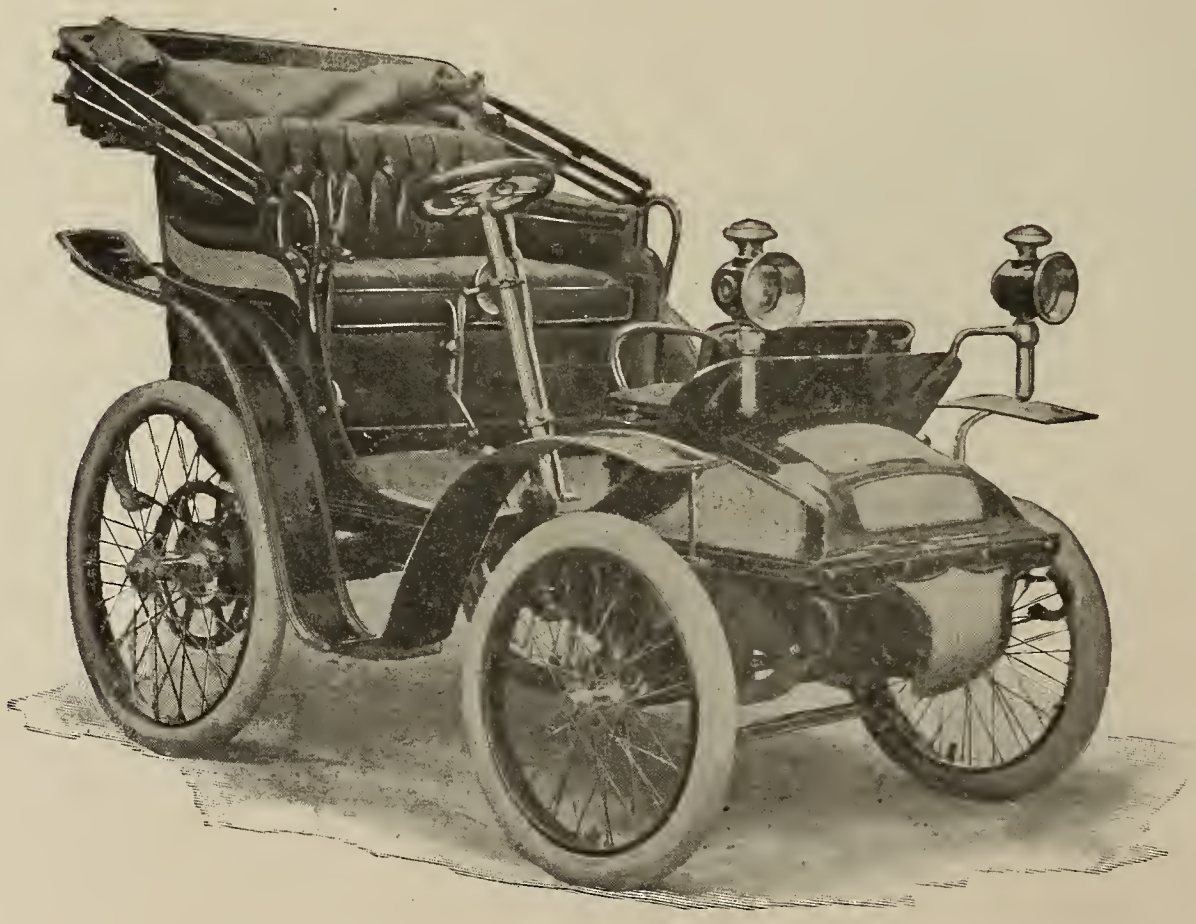


Fig. 1. Automobile Victoria.

camp complete, and at the rate of two and a half to four miles an hour it will go from two hundred and fifty to four hundred miles with the ordinary supply of hydrocarbon. It is fitted with a commissary compartment, in which can be carried enough provisions to last many days. There is mounted upon the truck an ore crusher that can be connected directly to the motor, and an assay furnace outfit to test the gold-bearing ore as it may be found. The seat can be turned down and will provide a bunk for two persons, and in practice while one man acts as navigator steering the wagon, his companion can be busy making assays of their findings about in the same way that an expert would in a well-equipped laboratory. As the prospecting vehicle carries a supply of fuel in the way of hydrocarbon, prospectors can start and go into the arid country one hundred and fifty miles away from their fuel supply. With a good supply of water and provisions and an extra barrel or two of gasoline aboard, they will be equipped to do prospecting that is impossible now. With a canopy stretching over the wagon, at night it is virtually a tent in which there is provided every convenience of an up-to-date laboratory, and also a cozy kitchen in which everything can be cooked and light provided from the hydrocarbon gas equal to the light we enjoy in New York.

Illustration, Fig. 1, shows an automobile suitable for two persons, and while the cut shows the ordinary bicycle wheel, the company say that practice has proven to them that a good, substantial wooden wheel is preferable, even though the body of the wagon be light. The running gear should be firm and rigid to effect durability. Fig. 2 illustrates one of the company's wagons to be put in service at Mojava, Cal.



Fig. 2. Automobile for Mining Purposes.

EXHIBIT OF THE HOLYOKE AUTOMOBILE COMPANY.

The Holyoke Automobile Company, whose works are at Holyoke, Mass., will show one of their cross-country touring surreys at the Madison Square Garden Exhibition. The Holyoke carriages are driven by gasolene engines and differ materially in construction from the majority of automobiles. There is no countershaft running and no gearing except for extreme hills. The body of the carriage does not carry any of the machinery.

The running gear of the carriage consists of a frame of heavy channel irons, having pivoted at its forward end a front axle so that the wheels may follow the inequalities of the road without straining the frame. The rear axle is carried in a pair of bronze yokes, which allow of its removal by unbolting the yoke bars and break rods and loosening the chains. The engine is carried in its own frame which is supported on transoms on the running gear. The engine frame carries the clutches and their mechanism so that they may be removed as one piece from the engine by loosening a few bolts. The channel iron frame is supported on the rear axle by coiled springs inside the yokes, so that the engine, which is a two-cylinder vertical one, completely water jacketed, is spring supported and the jolting of the road reduced to a minimum. No carburetor is used, but a special mixing device which is unusually perfect, and does not require adjustment. The ignition is electrical and of the make and break type, the current being supplied by a dynamo driven from the engine, the dynamo also furnishing current for the side lights. A small battery is employed for starting, which is exceedingly easy, a half turn of the crank being usually sufficient; the relief valves on the engine reducing the muscular effort to a minimum by destroying the compression during starting. The clutches are unusually large, being a foot in diameter. They are carried directly on the engine shaft and are contained within the fly wheels, of which they form a part. The high speed gear and the medium speed are both taken directly from the engine shaft by a direct chain drive by means of the two clutches. There is thus no gearing in use the greater part of the time, as the medium speed will ascend a ten per cent. grade on a good road. For extreme hills and for backing, gearing is employed which is driven from the medium speed clutch. All the gearing is contained on the back axle and is removeable with it.

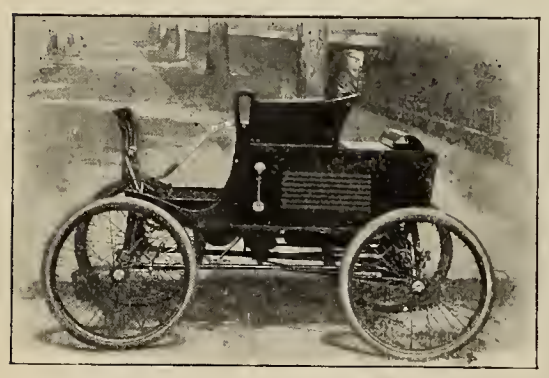
The carriage body is carried directly on the axles by double elliptic springs and has no other connection with the running gear except the clutch and break rods. Two powerful band brakes are applied to the rear axle. They will stop the carriage within seventy-five feet without shock or jar, going down a five per cent. grade at a speed of twenty-five miles an hour. The steering is done by

means of a screw which renders the wheels irreversible and prevents the transmission of heavy shocks from the road to the steering handle. So perfect is this device that a gutter has been jumped at a speed of twenty-five miles an honr, with hands off, without altering the course of the carriage in the least.

The company's latest type of body is an all metal one, designed with the special reference to the accessibility of the machinery, and to carrying luggage. The side, front, back and top of the seat are all made removable by the use of a small key. In front is a large hollow dash-board for carrying mackintoshes and other light luggage, while on the phaeton and runabout type, there is provided a place in back of the seat, for carrying a suit case or two. In the surrey, storage space is under the front seat. The only difference between the surrey and phaeton is in the body, the running gears and engines are the same. The bodies are interchangeable. A speed of twenty-five miles an hour on good level roads is attained and five miles an hour on twenty per cent. grades. The speed of the engine is controlled with a throttle by which the speed of the carriage may be varied from seven to twenty-five miles an hour, with the high speed clutch in use. The carriages carry fuel supply for 150 miles of ordinary roads and water sufficient for 50 miles.

These carriages are essentially for heavy touring work and cross-country runs. They are built more on the lines of a Pullman car than of a light speed wagon, and have been subjected to some severe tests to prove their durability. It is not considered that weight is any objection where needed to gain strength and durability, as the engines are well able to take care of all the load they have to pull.

THE STEAM VEHICLE COMPANY OF AMERICA



The Reading.

The exhibit of this firm comprises three styles of the "Reading" steam carriage, viz.: A Stanhope, a Stanhope with a top, and a delivery wagon. As the name of the company implies, the motive power used is steam, but in its utilization many new features have been evolved.

The engine is of an entirely new design, having four cylinders and a unique and desirable valve motion. The valve is a circular one, rotating in one dircetion with a smooth and balanced motion. The engine horse power is 5 3-4. There is no replacing of the mechanism required, as none is used; the engine will run indefinitely without further attention than filling one lubricator. The boiler is of extra large capacity, constructed of seamless steel, being tested up to 700 pounds water pressure; having safety valves in addition, there is no possible chance of accident.

The burner is scientifically designed and produces 180 steam from cold water in ten minutes, and will keep steam at 140 to 180 under all reasonable circumstances.

All the latest improvements are to be found in the carriage, such as water columns, auxiliary hand pumps, etc., and, in addition, such longed-for improvements as a brake which locks either forward or back, initial vaporizing without a torch, absence of excessive attention to lubrication, etc., large oil and water capacity. The finish and outside design of the carriage are as superior as can be produced.

These vehicles have been on the market experimentally for over a year, but have not been fully exploited until thoroughly tested as to their unsurpassed merits as a road machine.

A. Schwarzenbach is the president of the Steam Vehicle Company of America, whose offices are at 253 Broadway, New York City.

HILL CLIMBING AUTOMOBILES AT THE AUTOMOBILE SHOW.

One of the features of the show of the Automobile Club of America in the Madison Square Garden, Nov. 3d to 10th, will be an exhibition of hill climbing, and the possibilities of the machine on a steep incline. On the roof of the Garden has been constructed a runway of solid timering beginning at the centre of the Roof Garden, running along the Madison avenue side, turning at the Madison avenue corner and continuing up into the second story of the tower. The grade is steeper than any which is likely to be met on the ordinary road in this part of the country, and is only met in the mountainous districts of the West, where the test of the horseless carriage is greatest. On the artificial hill the locomobile will be run to show that no grade is impossible to it, and the exhibition of the machine under these conditions is sure to be one of the most interesting features of the show, as, in addition to the steepness of the grade, there is a sharp turn midway up the incline which will tax the ability of the chaffeur to the utmost. Every inch of space in the Garden has been taken for the show, and if the place had been twice as big it would not have held the intending exhibitors. The extent to which the industry has increased in this country since the Bicycle Show of a year ago, when it was thought that twenty machines was a goodly number, is somewhat surprising even to the members of the Automobile Club, who keep in touch with the progress of the industry. Everything points to a beginning which will make the annual Automobile Show as much a feature of the winter season in New York as is the Horse Show. The machines shown will be of every type imaginable, and the makers have been preparing for months to outdo each other in beauty of carriages and in novelty of construction. Public curiosity in regard to the new conveyance is at its height and those who visit the show are sure to find plenty to entertain them, even if the attraction of the contests and exhibitions of the automobiles in motion were not to be enjoyed.

DIXON'S GRAPHITE AND LUBRICANTS FOR AUTOMOBILES.

No matter what type of automobile is used, it is desirable to waste as little power as possible, and to do this, the running parts must not only run properly—they must run smoothly and with the least amount of friction. For the best results, and for the greatest amount of pleasure to the occupants, the automobile must be treated as a machine; the same as the locomotive and the stationary engine.

The Joseph Dixon Crucible Co., of Jersey City, New Jersey, have secured Booth One at the Madison Square Garden Automobile Exhibition, Nov. 3 to 10, and Mr. John H. Baird will be in attendance to explain the graphite products of the company and their value as applied to automobiles.

The following lines will be shown in barrels: Waterproof graphite grease, graphitoleo, graphite lubricant for chainless wheels and gears of electric motors, graphite compound for pipe joints, everlasting graphite axle grease, pure flake Ticonderoga lubricating graphite, graphited wood grease for gears of enclosed motors, silica-graphite paint, oiled graphite No. 7847.

ALCOHOL PLOW LOCOMOBILES IN GERMANY.

On July 25 the motor factory of Oberursel, near Frankfort, exhibited in the presence of a number of experts its new alcohol plow locomobiles. The plow locomobile is a 20-horse power one, and confidence is expressed by competent judges that coal can in some cases be substituted by alcohol, which can be procured everywhere and at a low cost. The alcohol plow is said to have performed its work fully as well as a steam plow operated simultaneously. The problem of using alcohol for power purposes has been solved by the motor factory in evaporating denaturized alcohol of 90 degrees. The construction and operation of the motor is, after this gasification, the same as that of a gas motor. The machine uses about a pint of alcohol an hour for 1 horse power. It is claimed that the operating expense is 25 per cent. lower than that of steam plows.

AUTOMOBILE REGULATIONS IN CHEMNITZ.

(1) Persons under fifteen years of age and persons who have no knowledge as to the management of such machines shall not be intrusted with the running of automobiles.

(2) All persons who do not give their undivided attention to the management of automobiles or who while using the same fall asleep or get intoxicated are liable to punishment.

(3) The signal to turn out shall be "Heeh." The use of signal horns will be permitted until further notice.

(4) Every automobiie must carry at least one very good lantern; the same shall be lighted at the same time as the street lights.

(5 The speed of automobiles in the city shall not be faster than that of an ordinary trotting horse.

No one shall run an automobile faster than a horse walks—

(a) On leaving buildings or sheds bordering on the street.

(b) During church service in the neighborhood of churches.

(d) In places where there is large foot traffic.

(e) In places where fast driving is forbidden.

(6) Automobiles shall not be left unattended on the street.

Anyone disobeying these rules shall be punished.

Electric Street Railway Practise.

POLYPHASE MOTORS FOR STREET RAILWAYS.

One of the points in favor of polyphase railway motors is their action in holding back, by returning energy to the feeders, when they are driven above speed by a car running down hill. This action is entirely different from any that may be simply gained in series-wound continuous-current motors, but is analogous to the performance which would be shown by shunt-wound motors under similar conditions if they could be satisfactorily adapted to the requirements of electric traction. The action is very simple, and is a safeguard which cannot be overestimated for cars operated over heavy grades. We will spppose that a car approaches a dip in grade with the motors working. Upon entering the grade, it is natural for the speed of the car to increase, which, with continuous-current, series-wound motors, will continue until the speed quickly becomes dangerous unless the motors are cut off and the brakes applied. A failure in brakes under these conditions has often resulted in frightful accidents. Not so with induction motors! As the car increases in speed the forward rotary effort of the motor decreases, and gradually and smoothly changes into a retarding effort, while the power given up by the car as it coasts down hill is automatically returned by the motors to the line. Thus the power of the descending car is automatically placed where it may be usefully applied in operating other cars, instead of being frittered away in wasteful and injurious friction between brake-shoes and wheels. All this is done by inherent action in the motors themselves and is entirely independent of fallible humanity, represented by the motorman. Stops may be made on a grade in the usual manner by cutting off the motors and applying the brakes, and starting is accomplished by the ordinary process, after which the motors may again be left to care for themselves. It is interesting, further, to note that polyphase alternating current railway plant, properly installed, removes much of the difficulty from electrolysis of water pipes and other underground metallic structures, notwithstanding the use of the rails for one branch of the circuit; but, on the other hand, in the line construction are involved all the difficulties of the double trolley.—Cassier's Magazine.

Expositions.

PAN-AMERICAN EXPOSITION.

The Bureau of Publicity of the Pan-American Exposition has just issued a very complete booklet descriptive of the enterprise to be held at Buffalo next year. The booklet contains 48 pages with 121 titles and 82 illustrations. The publicity up to the present time has been piecemeal, bringing out the various features as they have developed, but an examination of this booklet gives to the reader a very comprehensive idea of the splendid character of the Exposition.

The total cost of the Exposition, exclusive of exhibits, is now estimated at $10,000,000. Of this amount about $3,000,000 will be expended upon the Midway. The sum for the Midway is more than the total cost of some very pretentious expositions, so that by comparison one may gain a very fair idea of the work which Buffalo is carrying rapidly to completion. A beautiful landscape comprising 350 acres, half a mile wide and a mile and a quarter long, is devoted to this wonderful enterprise.

The word "Pan" as a prefix to American means All—that is to say, the Exposition is for all the Americas, exhibits from European countries not being accepted. It is claimed for the Pan-American Exposition that it will be the most artistic creation of the kind ever brought into existence. It will excel all former expositions in its court settings, having 33 acres of courts alone upon which to bestow the wonderful embellishments of fountains and cascades, pools and lakes, canals and lagoons, lawns and gardens. The twenty or more great structures which are to shelter the exhibits gathered from all corners of the Western Hemisphere and from all the island possessions of the United States will surround these courts. Every building is richly adorned with plastic ornamentation and tinted in accordance with a magnificent color scheme under direction of Charles Y. Turner, the leading artist of the world in this work.

No exposition has ever undertaken such an extensive use of sculpture for decorative purposes. This work is under the master direction of Karl Bitter, who has added to the vast knowledge and infinite skill which gave him the leading position at the World's Fair at Chicago, the experience of seven more years of activity in his profession. Under his direction thirty or more sculptors, em-

bracing all the leading artists of this class in the United States, are at work upon more than 125 groups of original sculpture.

In the use of electric lights for decorative purposes this Exposition will outshine all former undertakings. Owing to the nearness of Niagara Falls, with unlimited electric power, the Pan-American Exposition has at hand a large volume of energy which will be employed to whatever extent may be necessary to produce the most brilliant, fantastic and beautiful electric lighting effects the world has ever seen. The exhibits of the Exposition are divided into about twenty classes and embrace every line of human activity.

The gates of the Exposition will open on May 1, 1901, continuing six months. Buffalo, a city of nearly 400,000 population, one of the most charming cities of the world and having a climate 10 degrees cooler than any other city of the Northern States in summer, is preparing to welcome millions of strangers to its gates next year.



STREETS OF MEXICO.

It is said of the Midway at the Pan-American Exposition in Buffalo next year that it will be the most extensive, as well as the most expensive, aggregation of amusement features ever brought together at any exposition. It will have more than a mile of frontage. Among the large concessions is that of the "Streets of Mexico," which occupies 95,000 square feet upon the south side of the Midway near the main eastern entrance. This concession will present a graphic picture of Mexican life, both the old and the new. The vista, as one stands at the entrance to the Streets of Mexico, is extremely picturesque and invites a closer examination. Two tall towers, with a high arch between them, form the entrance. Entering the street, stores may be seen on either side, where Mexican wares of all kinds will be on sale. The large number of Mexicans who will be in charge of the concession will be attired in their native dress and one may readily imagine himself suddenly transported to the heart of the thrifty republic. At the extreme right of the stores are the army headquarters for the convenience of the company of 100 mounted men or as they are known in Mexico, "rurales," who will attend the Exposition by order of President Diaz of Mexico. At the left is the Mexican restaurant, and east of the restaurant the theatre. Proceeding southward we come to a large open space, the southern part of which is known as the "Plaza of Flowers." In the center of this is the band stand where a company of expert musicians will play Mexican airs. The architecture all about the Plaza is of strictly Mexican style and very elaborate. On the right is a Mexican dance hall, and south of the dance hall a Mexican market and an old rural village with its abode huts and a representation of the cliff dwellers of Mexico. At the extreme southern end of the Plaza is a Mexican Cathedral most gorgeous in detail. At the extreme southeast corner is the "Plaza de Toros" where Mexican equestrian and other sports characteristic of Mexico will take place. It should be remembered that the dances in the dance halls will be of the Mexican character, that the restaurants will serve Mexican food and in the markets and stores will be sold Mexican products. The theatre will be conducted after the manner of Mexican play houses, and every feature will reproduce Mexican life. In the village will be shown Aztec Indian relics and in the shops will be blanket makers, cane carvers, onyx and filigree jewelry workers, leather workers, opal polishers, pottery makers and others who are skilled in Mexican handicraft. There will also be a

Mexican band playing peculiar native instruments. Surrounding the Plaza will be portales, or open arcades, where the visitors may sit at tables, partake of a luncheon and view the interesting scenes upon the Plaza. This concession has the approval of the Mexican government which has lent its assistance heartily to make it a true representation of the various phases of life in that country.

SMOKE ABATEMENT.

By W. H. Bryan.*

The largest smoke makers, and the most difficult to deal with, have always been the furnaces of steam boilers, and it is to these that this article is particularly addressed. Under certain conditions of wind and atmosphere the smoke from all chimneys may be carried long distances, and its damaging and polluting effects may be felt many miles away. No war against the smoke nuisance can be waged successfully without a good working ordinance, clearly defining the character of the smoke emission which is unlawful, and providing suitable penalties. Many such ordinances have been passed; in fact, nearly all of the larger cities of the United States have enacted legislation of this kind. Much of this was experimental, and, when carried into the courts, did not withstand the attacks of opposing counsel. Many ordinances were declared invalid, but some have been upheld by the higher courts.

In addition to providing a good ordinance, a municipality can help the movement in other ways. It can provide an expert commission, to aid smoke makers in finding proper remedies, and to investigate and test improved devices. And, most important of all, it can take the lead and set a good example by stopping the smoke from its own furnaces, in waterworks, schools, public buildings and institutions.

With such wide-spreading knowledge of the harmful effects of smoke, it seems surprising that there should be any opposition to its abatement. A smoke movement in any community has almost universal encouragement and support at its inception, and it is only after repressive measures have been adopted that dissatisfaction begins to develop. It was to be expected that all would favor doing away with smoke when it cost the individual nothing. But when a particular offender is called upon as a good citizen to do his share of the general duty, he is not always ready. It is then that we hear that the prevention of smoke is a hardship to the manufacturer, that he cannot conduct his business successfully without making smoke, and that smoky chimneys are an evidence of business and prosperity, and that a busy community, even if smoky, is better to live in than an inactive one, even though it may have a clear sky. The answer is simply that smokeless chimneys are not inconsistent with the greatest industrial activity and the economical use of low-grade fuels.

*In "Cassier's Magazine."

A NEW THING UNDER THE SUN.

When the wise man of old wrote "there is no new thing under the sun," he hadn't read this latest and one of the best things in advertisements, constructed by an Alexandria Bay, N. Y., genius:

"The other day I overhead Mr. Daniels, of the New York Central, say that as he had found the American people prompt to find fault when displeased, he assumed that while no complaint was being made his service was satisfactory. Mr. Daniels is quiet mannered, speaks carefully, with well modulated voice, that inspires the listener with respect and confidence, and although I disagree with him in his policy of issuing passes to people who are able to pay, or go afoot instead of using their muscular tissue across golf links, I agree with him in this: I have found American people quick to find fault, and sometimes where fault does not exist, I have found that they are also prompt to appreciate consistent hustle; if they find that a man is quick to acknowledge a fault and prompt in setting about to correct it, they are disposed to let him off easily.

"According to Mr. Daniels' rule, I must believe that we are giving better service than ever, as there has been hardly one unconventional kick so far this season."—From the Brooklyn Standard Union.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.

PATENTS ISSUED OCTOBER 23, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of five cents.

660,124. Telephone system. Lambert Schmidt, Weehawken, N. J.

660,134. Automatic circuit breaker and closer. Wm. Watzel and Forrest Shekell, Washington, D. C.

660,138 and 660,139. Thermo-electric cell. Ernest Yost and Wm. Smith, N. Y.

660,140. Insulator. Cassius Alley, Pendleton, Ind.

660,155 and 660,156. Method of controlling moving vessels or vehicles. Bradley Fiske, U. S. Navy.

660,199. Telautograph or facsimile-telegraph. Anton Pollack, Szentes, Austria-Hungary. Selenium and paper sensitive to beams of light are used in this invention.

660,228. Plate for storage batteries. Elmer Sperry, Cleveland, Ohio.

660,263. Electric linotype-machine. Alfred W. Storm, Ramsey, N. J.

660,293. Electric meter. Thomas A. Edison, Llewellyn Park, N. J.

660,305. Thermo-electric battery. Jesse Oliver, Memphis, Tenn.

660,313. Lightning-arrester. Chas. J. Reed, Philadelphia.

660,320. System of electric distribution. Chas. J. Young, Philadelphia, Pa.

660,340. Safety cut-out. Joseph Sachs, Hartford, Conn.

Business News.

MEXICAN ELECTRIC LIGHTING PROJECT.

A new company has been formed in Mexico to erect and operate a plant for the town of Linares, Mexico. The name of the company is Compania Alumbrado Electrica y Fuerza de Linares, State of Neuva Leon, Mexico, which has been organized with a capital of $100,000, all subscribed. They will install a strictly modern and up-to-date plant consisting of about 2,000-16 candle power incandescents, 35 arcs, 100 horse power in small motors, 150 fans. The electrical equipment will consist of two 75 K. W., 3-phase, 60 cycle, 2,300 volt machines, 6-25 K. W. transformers. The steam plant will consist of one 110 horse power high speed Ideal engine, 140 horse power Springfield boilers, Stillwell heater and separator, Worthington pumps; and hydraulic plant will consist of 1-15-inch McCormick turbine operating under a 50 ft. head, carried in 36-inch slip-joint pipe a distance of 200 feet from the reservoir to which the water is carried in a masonry ditch a distance of 3,000 feet from the river. System of distribution will be 3-wire primary with 4-wire secondary from a main transformer station in the

centre of the city. The power hourse will be two miles distant in the suburbs. A. W. McLimont, formerly of the General Electric Company's foreign department, is manager and resident engineer, under whose supervision the plant will be built and operated.

NEW INCORPORATIONS.

Andover, Ohio.—The Andover Electric Company has been incorporated by local capital for $6,000.

West New Brighton, S. I.—The Auto-Electric Shunt Company has been incorporated, with $5,000 capital, by local interests.

Denver, Colo.—Delos A. Campbell, J. A. Kebler, J. L. Jerome and J. C. Osgood, all of Denver, have recently incorporated the Mountain Telegraph Company for $1,000,000.

Warren, Ohio.—The Economy Electric Company has been incorporated by P. L. Webb, George H. Jones, George B. Sawyer, J. W. Powers and H. W. Smith, Jr. They will make dynamos, insulators, motors and electric supplies of all kinds. The capital stock is $50,000.

Sandusky, Ohio.—The Citizens' Electric Light and Power Company, which was recently incorporated with a capital stock of $100,000, will compete with the old company. Among the incorporators who are interested in the Sandusky & Interurban Railway Company are: J. B. Hanna, H. A. Everett, Barney Mahler, W. H. Price, George A. Stanley, Jas. Hoge, C. H. Stewart and Charles Wason.

TELEPHONE CALLS.

Roachdale, Ind.—Local capitalists have incorporated the Roachdale Union Telephone Company for $100,000, and active operations will soon be begun.

Guthrie, Okla. Ter.—A recent incorporation is the Washita Valley Telephone Company, whose headquarters will be at Mountain View.

Russellville, Ind.—C. H. Ramsay, Leonard Wilson and W. C. Boyd have incorporated the Starlin Telephone Company with a capital of $192,000.

Chatsworth, Ill.—Officials of the Peoria & Eastern Automatic Telephone Company have changed its name to the Peoria & Eastern Telephone Company and increased its capital stock from $12,000 to $25,000.

STREET RAILWAY NEWS.

Florence, Colo.—Local capitalists have incorporated an electric street railway company for $500,000.

Santa Fe, N. M.—Work is begun on the Sante Fe Street Railway Company, which has recently been incorporated for $250,000.

Indianapolis, Ind.—The Indiana & Ohio Traction Company has been incorporated for $750,000 to build an electric road between the cities of Mation and Hicksvlle, in Ohio.

Wabash, Ind.—A bond for the sum of $10,000 has been filed by the Wabash River Traction Company to begin construction work on the interurban road from Wheeling to Peru.

Albany, N. Y.—Certificates of the extension of the lines of the Amsterdam Street Railway Company and the Yonkers Railroad Company have been filed with the Secretary of State. The Amsterdam lines will run only over private property.

Columbus, Ohio.—Local capitalists have incorporated the Dayton-Maysville Electric Railway Company, of Morrow, at $10,000. It is proposed to construct a line from Dayton to Aberdeen along the banks of the Ohio river.

Charlestown, W. Va.—Articles of incorporation have been issued to the Wheeling Traction Company, which has been capitalized at $10,000 and will construct a street railway from Wheeling to Bridgeport and other towns in Ohio.

Columbus, Ohio.—The Toledo, Ohio, Interurban Railway Company was recently incorporated, with a capital stock of $100,000, by local men and will run northwest from Toledo through Lucas, Fulton and Williams counties, crossing the State line in the last named.

Albany, N. Y.—The Albany County Railroad Company has been incorporated to build an electric railway three-quarters of a mile long in the city. The capital stock is $20,000, and the directors are nearly all interested in the General Electric Company, of Schenectady, N. Y.

Charleston, W. Va.—Articles of incorporation have been filed for the Wheeling Traction Company, with a capital stock of $10,000. The incorporators are: A. M. Snyder, F. A. Henry, A. R. Manning and L. M. Hilreth, all of Cleveland. The company proposes to construct and operate an electric railway in Wheeling, W. Va., Bellaire, Bridgeport, and Martin's Ferry, Ohio, and in other adjacent Ohio towns.

Columbus, Ohio.—The board of decennial appraisers has notified the officers of the Columbus, Ohio, Street Railway Company that it has decided to list its city trackage at $10,000 per mile. The company owns 76 miles of tracks within the corporate limits, and the total taxable valuation will therefore be $760,000, in addition to which its personal property was placed on the tax duplicate some time ago at a valuation of $1,250,000.

NEW YORK NOTES.

THE HOLOPHANE GLASS COMPANY have removed their offices from 1 Broadway to 15 East 32d street.

THE NATIONAL CONDUIT AND CABLE CO., Times Building, manufacturers and the sole owners of patents for covering wires and cables with paper, has just received a telegram from Mr. Henry Floy, consulting engineer of the St. Paul, Minn., Gas Light Company, as follows: "Accept congratulations on successful test at thirty thousand two hundred volts which I made to-day on your three miles underground cable." The cable referred to is a three-conductor paper insulated lead covered cable to be operated at a pressure of 25,000 volts.

WESTON STANDARD ILLUMINATED DIAL

STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

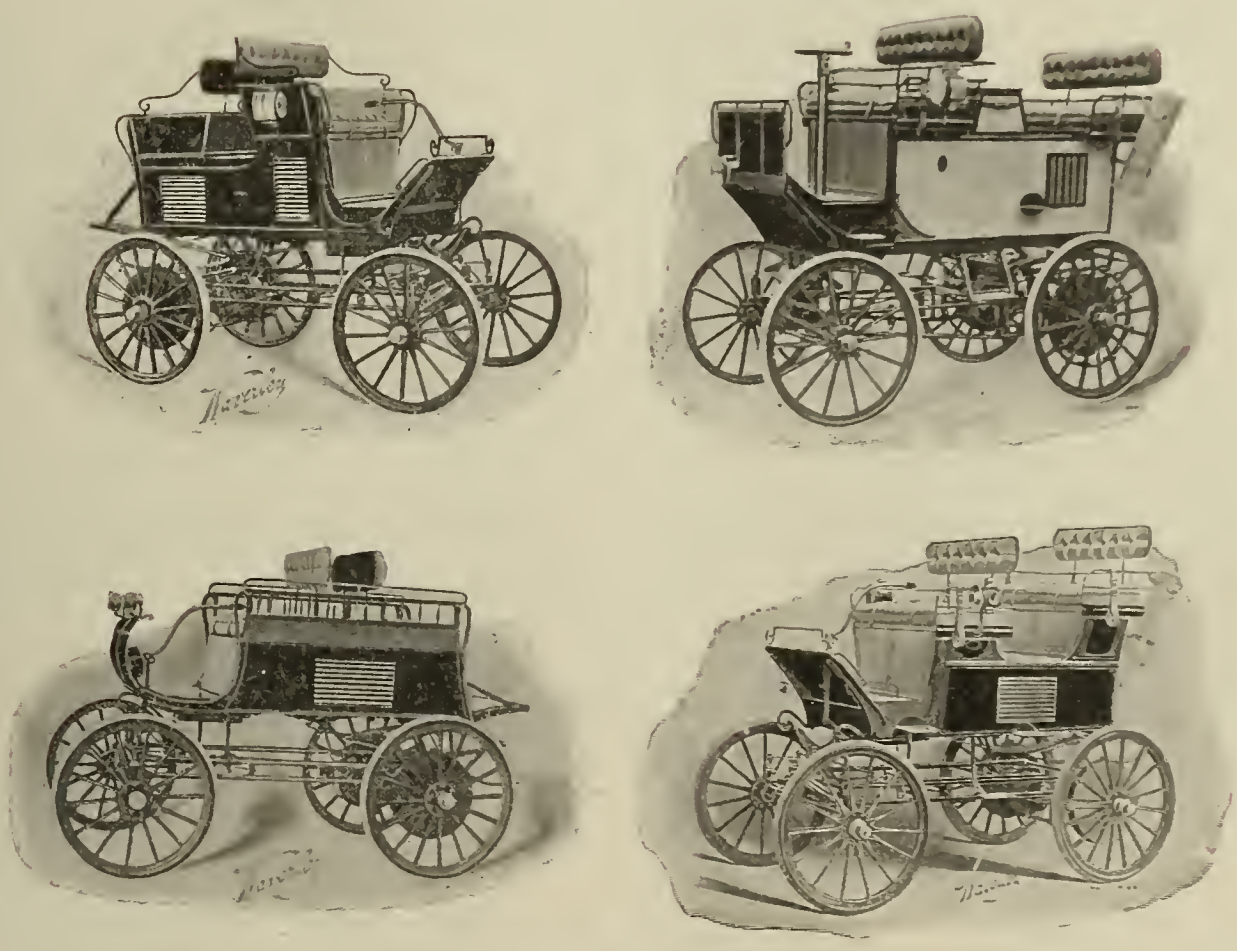
114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co. Ritterstrasse No. 88.
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 19. NEW YORK, NOVEMBER 10, 1900. Whole No. 704.

The Automobile.



Waverley Electric Vehicles.

Dos-a-Dos. Break. Newport Break. Dos-a-Dos.

(See page 166.)

AT THE AUTOMOBILE SHOW.

The Automobile Show closed Saturday night after an unqualified success. The idea of having a central track was so good that it certainly increased the attendance beyond the expectations of the management. The arrangement of the booths, which allowed the public to examine in detail all of the automobiles on exhibition, was very practical and led to an increased number of sales. From a social standpoint as well as a commercial one, the Show possessed features of the greatest interest. The automobile has become established in the stables of the wealthier class and has shown its universal application for department store delivery, express wagon use and, in fact, wherever neatness and speed are prime requisites. The daily papers as well as the technical press thought the present Show the finest of its kind, and in many respects it marks an epoch in the history of automobile construction that will be remembered for many years.

Every make of vehicle in this country, as well as many of the fast machines of foreign make owned by wealthy citizens of New York, were shown at the Madison Square Automobile Show, and for the first time in the history of the sport, the public was enabled to judge of the merits of the various machines in motion, as well as to form some idea of the beauty of the horseless carriage, and to make purchases on the spot if they so desired. Every manufacturer in the country of note was represented, and only a few of the minor makers were left out. If the Garden had been large enough they would have been there too, but there was a limit to capacity, even when the restaurant was added to the floor space of the great arena, and many were of necessity crowded out. As an example of the extent of the exhibition, one company alone showed 1 phaeton, 2 tricycles, 2 runabouts, 1 eleven-passenger wagonette, 2 delivery wagons, 1 six-passenger and 1 eight-passenger omnibuses, 3 victorias, 2 broughams, 1 surrey, 1 cabriolet and 1 hansom. All of these were not only beautiful specimens of carriages, but also examples of the best type of automobiles. Another company showed four types of motorettes, each having special features; one built to operate at a fair rate of speed up to 25 miles an hour, for pleasure purposes; another a surrey, with top for use in bad weather; another a doctor's brougham

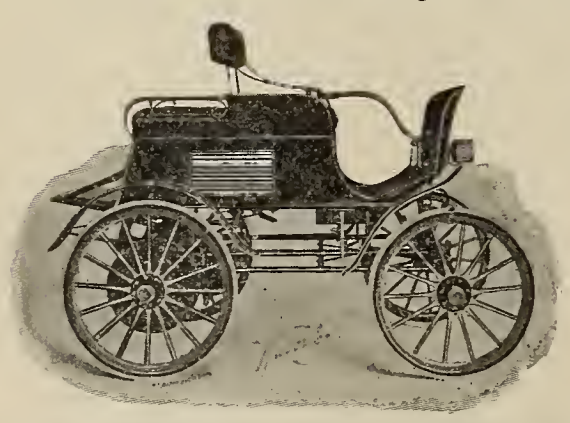
and another a gasoline hansom cab.

A new type of automobile was shown in a special two-cylinder motor, developing about 5 horse power, with a variable speed of from 160 to 900 revolutions per minute; power transmission is by gear, chain and sprocket, the gears and clutches being noiseless. A special hill climbing gear is provided on this machine, and it has a capacity of 150 miles on one charge. Another has a variable speed of from 150 to 1,000 revolutions per minute, and a capacity of 100 miles, with two speeds forward and a reverse to the gear which makes it possible to run at any speed desired.

In the following list will be found some of the most notable exhibits: The Automobile Company of America, 32 Broadway, New York City, showed a line of their gasoline carriages; Grant-Ferris Company, Troy, N. Y., the Howard hydro-carbon motor; the Veeder Manufacturing Company, Hartford, Conn., Veeder odometers; The Mobile Company of America, Kingsland Point, Tarrytown-on-Hudson, N. Y., their "Mobile" carriage; Upton Machine Co., 17 State street, New York city, the Upton transmission gear for automobiles; the "New York Tribune," the "Mobile" carriage offered as a prize by that paper; Stanley Manufacturing Company, Lawrence, Mass., their steam automobile; Chas. E. Miller, 97-101 Reade street, New York city, automobile accessories; Waltham Manufacturing Company, Waltham, Mass., motor bicycles, Autogos and automobiles; Knox Automobile Company, Springfield, Mass., the Knox gasoline runabout.

Among those who visited the show were Marcus Nathan, Geo. F. Porter, of Kerite—just returned from Alaska—and B. F. Pomeroy, of the Perfect Arc Lamp & Manufacturing Company, Brooklyn, N. Y.

WAVERLEY ELECTRIC VEHICLES.



Waverley electric vehicles are built (body excepted) entirely in the Waverley plant of the American Bicycle Company at Indianapolis, Ind. All parts are interchangeable, being made to gauge under the personal supervision of one head. Their manufacturing facilities are second to none in the world. The plant is equipped with every modern machine tool. The large mechanical force has had years of training in the exacting science of bicycle building. With these advantages, the company is able to produce vehicles that embody in their design and manufacture all the elements of simplicity, durability and reliability, at prices that will make them available to any person capable of owning and supporting a good horse.

The frame is made of cold drawn, highest grade seamless tubing, with forged connections brazed at each joint, the whole carrying a high factor of safety and capable of resisting extraordinary strains. The front axle is of tubular construction. It engagement with frame permits oscillation around horizontal king bolt, thus equalizing on uneven surfaces.

The wheels are ball bearing and provided with an effective arrangement for direct oiling. The company equips regularly with wood wheels and solid rubber tires, or, on order, with suspension wire wheels and pneumatic tires. They recommend the wood wheels.

The motor is manufactured in the Waverley factory, embodying all the special features and improvements

Waverley Electric Combination Delivery.



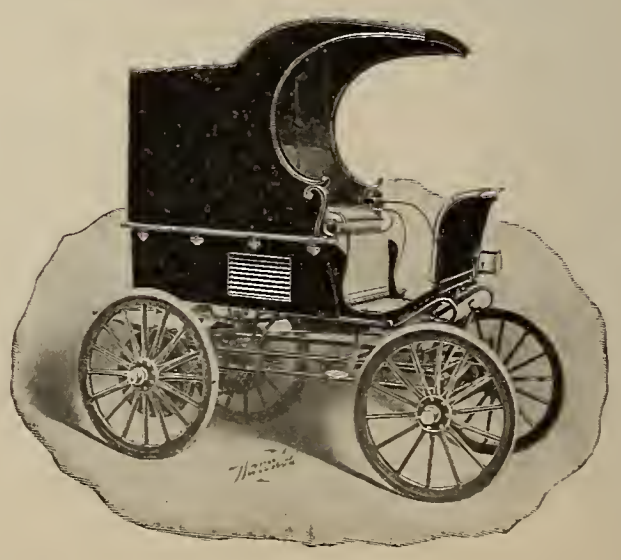
that experience has proved necessary in a motor for this class of work. It is of the multipolar iron type, very

Waverley Electric Model 19



efficient, dust-proof, self-oiling, and possesses an overload capacity that enables it to drive the vehicle satis-

Waverley Electric Combination Delivery.



factorily under the most trying conditions. It is connected with the rear wheels through single-reduction

gearing enclosed in dust-proof cases. Compensating gears placed on armature shaft, within motor casing, permit independent action of the rear wheels. Waverley electric vehicles are driven with the most durable and efficient storage battery produced. The company demonstrates their own faith and elimininates all doubt in the buyer's mind by providing a contract whereby the batteries are maintained, at a stipulated fee per annum, for a period of five years.

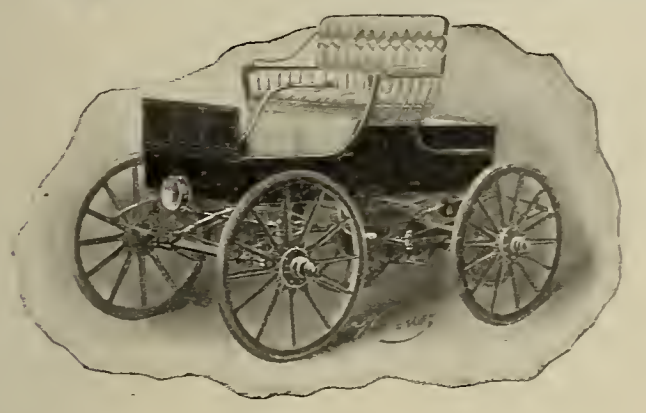
The absence of noise in the operation of the vehicles is largely due to the special form of spiral tooth gear that this company alone employs. The pinions of solid steel are not to be compared in durability with rawhide or brass and they run with practically no noise.

ture shaft, inside the motor casing, is actuated by a foot lever. A ratchet device enables the operator to lock this brake when it is desired to leave the vehicle standing on an incline. For use in localities where grades are particularly long and steep an auxiliary electric brake is supplied which enables the vehicle to descend long grades without wearing the shoes of the mechanical brake.

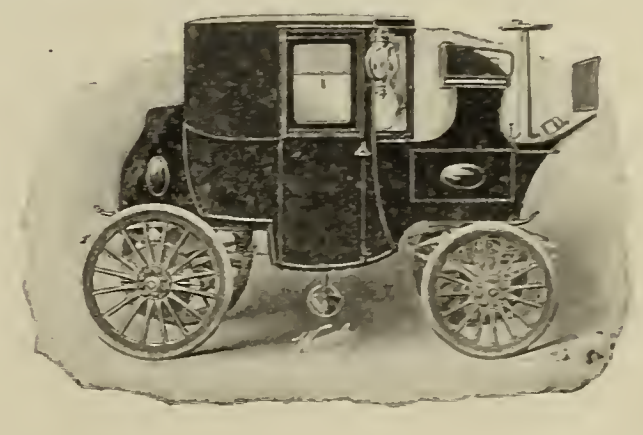
The carriage may be securely locked and rendered inoperative by the turn of a small key which the operator should take with him upon leaving the vehicle unattended.

Artistic electric lamps of special design and high finish are both signals and illuminators. Delivery wagons and

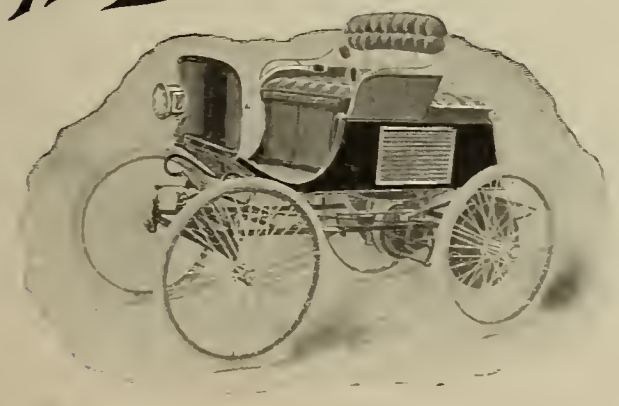
Waverley ELECTRIC MODEL 18



Waverley ELECTRIC DEMI-COACH



Waverley ELECTRIC RUNABOUT



Waverley ELECTRIC RUNABOUT



One lever is used for starting the vehicle, regulating its speed and reversing. This lever is conveniently located at the left side of the operator; it permits of five speeds forward and three backward.

The steering is easily accomplished through ball bearing mechanism by means of a lever arranged for the operator's right hand. An advantage peculiar to the Waverley carriage lies in the fact that this lever, being hinged near the base of dash-board, is readily pushed forward, allowing perfect freedom in entering or alighting from the carriage. The steering is natural, requiring small amplitude of lever movement. Full turn of vehicle may be made in space of twice its own length.

A powerful hand brake, applied to a drum on the armature shaft, inside the motor casing, is actuated by a foot lever. A ratchet device enables the operator to lock this brake when it is desired to leave the vehicle standing on an incline. For use in localities where grades are particularly long and steep an auxiliary electric brake is supplied which enables the vehicle to descend long grades without wearing the shoes of the mechanical brake.

The carriage may be securely locked and rendered inoperative by the turn of a small key which the operator should take with him upon leaving the vehicle unattended.

Artistic electric lamps of special design and high finish are both signals and illuminators. Delivery wagons and the coach are also lighted internally. An electric gong is a feature of each equipment.

The carriage bodies, of exclusive design, are made from the best material—braced, ironed and adapted to their special purpose. They are of modern type and graceful outline.

The regular finish of Waverly vehicles is of the highest class. The bodies are painted in combination shades of black and dark green, delicately decorated with carmine glaze; gears and wheels dark red or dark green with appropriate striping. The regular upholstery comprises on various models, the highest grades of dark or russet leather, gray tones in heavy whipcord and 22-ounce dark cloth with broad lace. Detail of finish will

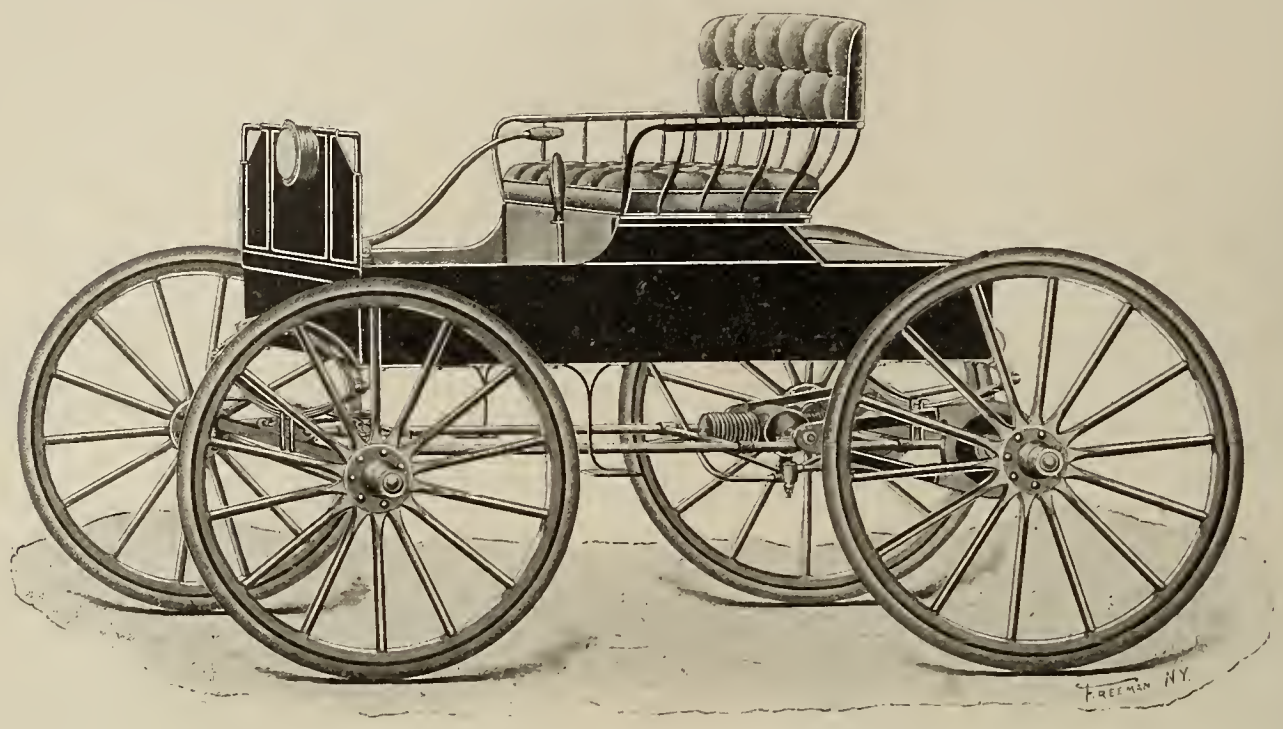
be left to individual taste, provided time is granted. Before shipment every carriage is thoroughly tested by a practical road run, during which it is subjected to more severe strain and stress than it is apt to encounter in ordinary service.

With every vehicle there are furnished, included in the price, all necessary tools, appliances and instruments for the proper charging and operation, including a combination volt-ammeter, of standard make, attached to the foot-board. This instrument is useful in two ways. When the vehicle is being charged it indicates the rate of current and shows when the batteries are full. When the vehicle is running it indicates the current going to the motor and informs the operator as to reserve power in battery.

Delivery wagons of the larger type are equipped with a special screw wheel and screw steering system. They are provided with powerful motors, locking foot brake and auxiliary electric brake.

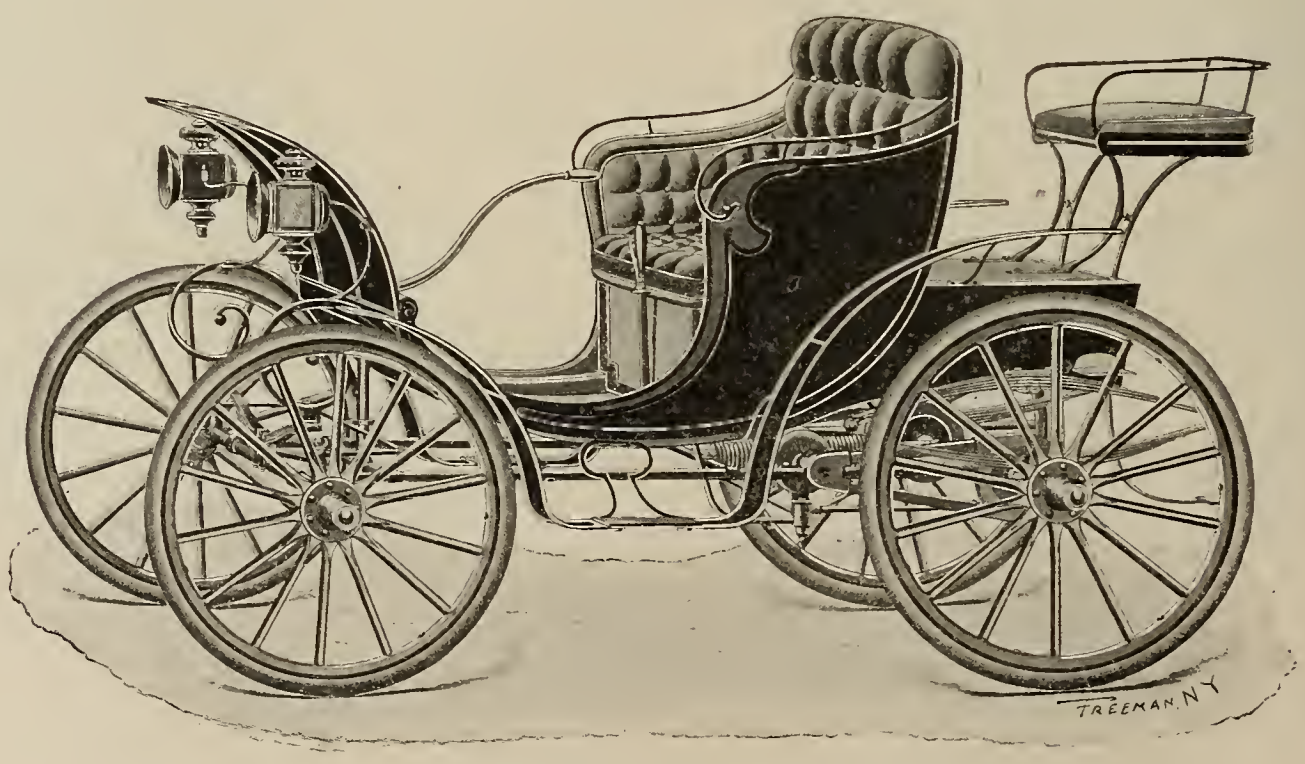
THE NEW YORK AUTOMOBILE COMPANY.

The New York Automobile Company, with offices at 13-21 Park Row, New York city, are engaged in the manufacture of gasoline, electric and steam vehicles. In the illustrations are shown types of machines such as the



New York Automobile Company's Road Wagon.

balanced duplex un-spark engine, made in sizes of 3, 5, 7½, 10, 12½, 15 and 20 horse power; the single acting gasoline motor, built in sizes of 1, 1½, 2, 2½, 3 and 3½ horse power with a speed of from 300 to 1,100 revolutions a minute and the duplex reversing engine, made in sizes of 3, 4, 6, 8, 10, 12½, 15, 17½ and 20 horse power.



New York Automobile Company's Victoria.

The balanced duplex uni-spark engines are specially devised for automobiles. They are built with two oppositely situated pistons, connected to the crank shaft in such a manner as to exert the energy of the explosion occurring in the supplemental chamber located some distance from the cylinder in which the pistons travel. The

The Electrical Age.

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Newton Harrison, E. E., Editor.

Walter Mueller, Managing Editor.

ASSOCIATE EDITORS.

Electric Light and Power.

Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.

Electro-Therapeutics.

Joseph Muir, M. D.
Frederick Strange Kolle, M. D.

NEW YORK, NOVEMBER 10, 1900.

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THE FIREMAN'S SCAPEGOAT.

If we were to believe all the misrepresentations that emanate from the mouths of firemen and fire inspectors electric current would be as dangerous to introduce into a building as a can of nitro-glycerine. Of late there seems to be a tendency arising to put the blame for all fires upon the wiring, should perchance an opportunity arise. Those that are supposed to know, and whose opinion is therefore sometimes made use of in regard to fires, use the electric wire as a scapegoat. With the conditions as follows: a building, electric wiring and a fire, there seems to be but one conclusion possible, according to the logic of this class, that the fire must have been caused by electric wires. The fire which occurred in Warren street was attributed to this cause, although it is absolutely beyond the comprehension of either the electrical contractor or the fire underwriter to explain how the fire could occur through electric wires if the building had been properly inspected when the wiring was completed. Every precaution is now taken to avoid even the remotest possibility of fire when wires are installed. The fuses, the joints in the wire, should any be made, the size of the wire, the character of its insulation, and, in fact, even the mechanical protection of the wire, are demanded before a permit is issued and a certificate granted, whether the wiring pertain to a large building or a concrete cellar. It is almost a slur upon the underwriters and the fire department to claim that the fires of this nature were caused by defective wiring. As long as boys smoke cigarettes and strike matches so long will the cause of many fires remain unknown.

THE ELECTRICAL EXTRACTION OF PHOSPHORUS FROM PHOSPHATE ROCK.

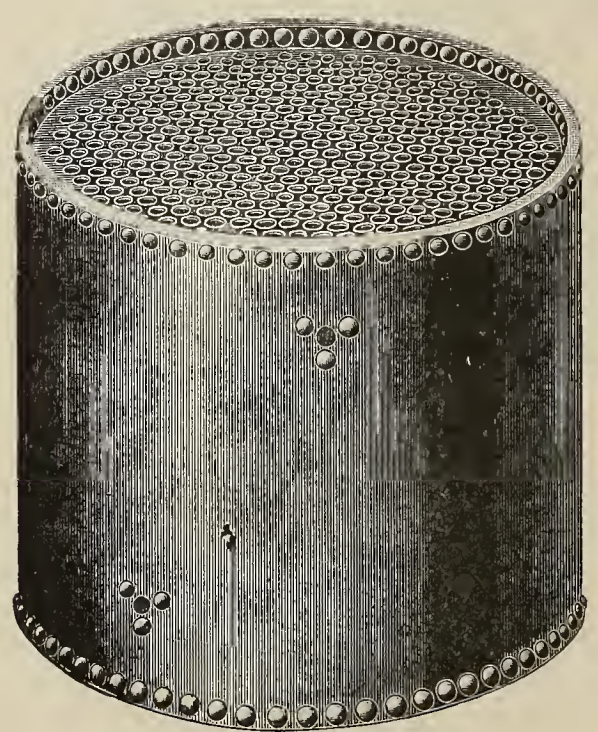
The extraction of phosphorus from phosphate rock by means of electricity has been successfully accomplished by Dr. Machalske. It is well known in the particular branch of applied chemistry devoted to the manufacture of phosphorus that phosphorus is the only element for the ordinary preparation of which animal substances are employed. Phosphorus is generally found in combination with certain minerals as a phosphate of lime, such minerals, for instance, as coporolite, phosphorite and appatite. The old fashioned method of extracting phosphorus is purely chemical in its character and the idea occurred to Dr. F. J. Machalske to utilize electricity and endeavor by its aid to produce the phosphorus directly without the intermediate chemical processes being required. He uses an electric furnace; two carbons, or, at least, carbon electrodes; the phosphate rock placed between them is melted, setting free vapors of phosphorus which are condensed under water and the residual slag in a viscous state allowed to escape.

According to the picturesque description of an eye witness "the interior of the furnace reminds one of a dark crater, the dull red poles revealing a metallic lustre and grey shadows of the rock beneath them. A little later these poles become tipped with dazzling white and in the course of three to four minutes the temperature rises to about 6,000 degrees. Such a temperature will keep well melted any known metal, though 2,000 degrees more are obtained in this furnace."

The report of the U. S. Geological Survey shows that the product of phosphate rock was valued in 1898 at about $3,500,000, the rock costing about $2.50 per ton. By means of Dr. Machalske's method phosphate rock converted into phosphorus will yield about $80 worth of that material at the lowest market price. The applications and uses of phosphorus are varied and by means of a special arrangement Dr. Machalske's furnace turns out other products having commercial use in the arts and industries. So far the electric furnace has produced calcium carbide and carborundum, exceedingly valuable produces. This last and latest of the list will probably meet with the same success as the former.

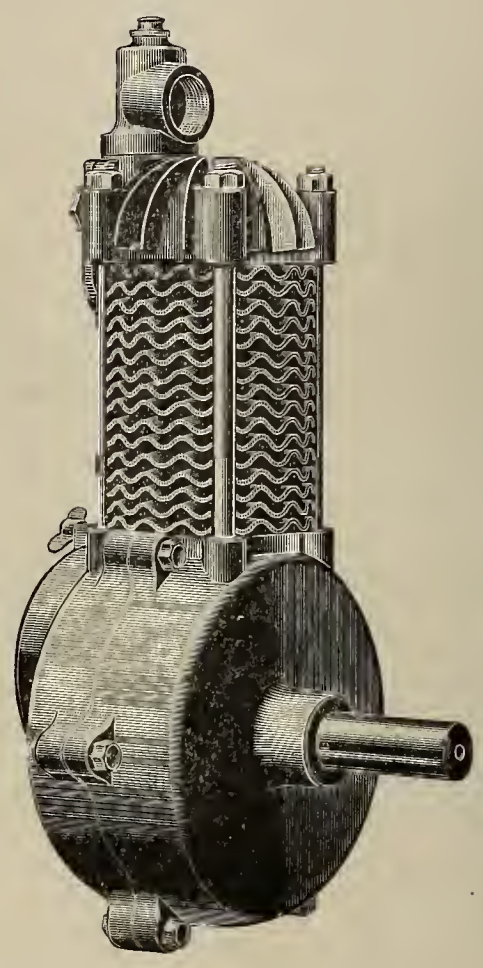
With the conclusion of the election the continuance of prosperity remains assured. The electrical industries will make a showing before the close of this year far beyond the expectations of even the most sanguine. The manufacturers of lamps and wire, dynamos and motors are working day and night to fill not only the domestic orders coming in from all sides but heavy export orders as well. Judging from the rate of increase in the last four years the next four will probably show the same remarkable growth of trade and the further extension of commercial relations with foreign countries. The exports in electrical machinery aggregate large figures at present and foreign competition has proven very ineffectual as regards either time of delivery or actual cost. In consequence of this the American manufacturer of electrical machinery is doing a large business in England and her colonies; in Russia and Germany and the South American countries, as of old.

engine is made operative by means of a single explosion, the explosion chamber being located far away from and independent of the cylinders in which the pistons operate. A uniform speed is secured, rapid radiation of heat and a high efficiency. The single acting gasoline motor finds its application where small power is required. It is built so as to exclude all dust and moisture, is light in weight and readily attached to bicycles, tricycles, launches, etc. The duplex reversing engine is operated by steam. For compactness, efficiency, lightness and uniformity of speed it approaches perfection. The practical construction makes it very durable, and the tubular boilers B, illustrated, generate the steam used rapidly and economically. These boilers are heated by the vapor of gasoline and in less than eight minutes the automobile equipped with this device and engine is ready for service. The boilers are upright in type, built of steel and fitted with seamless copper tubes. Their weight is 150 pounds and they are tested up to 900 pounds before being used.

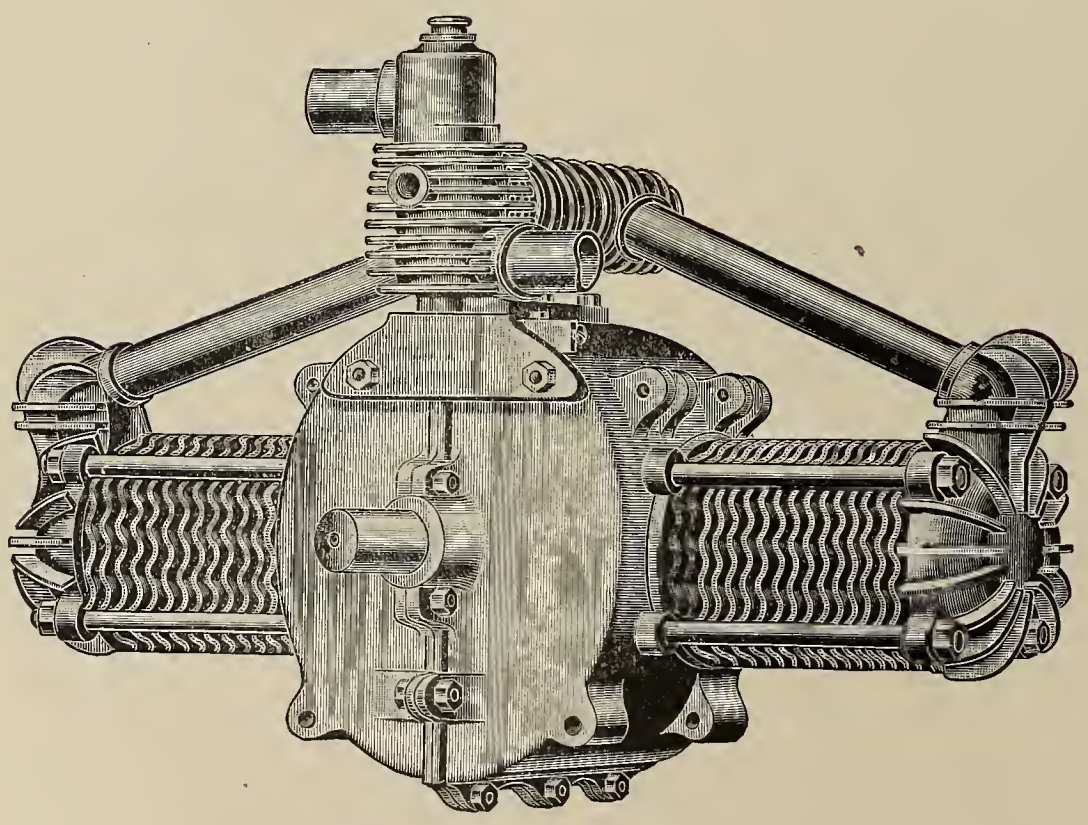


Tubular Boiler "B."

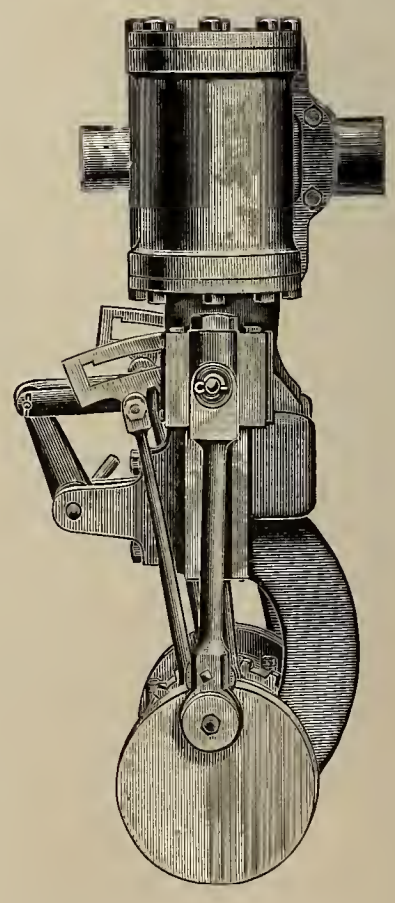
The spark coils employed for the gasoline engines are also shown, and in design stand unexcelled. They are waterproof in construction, thoroughly reliable in action and of necessity durable in every respect. The wipe spark coil is 1¼ inches and diameter and 2⅝ inches long. The special waterproof coil is exceedingly small and the coil box, encased, light and compact. When operated by dry batteries of the type shown ignition is



Single Acting Gasoline Motor.



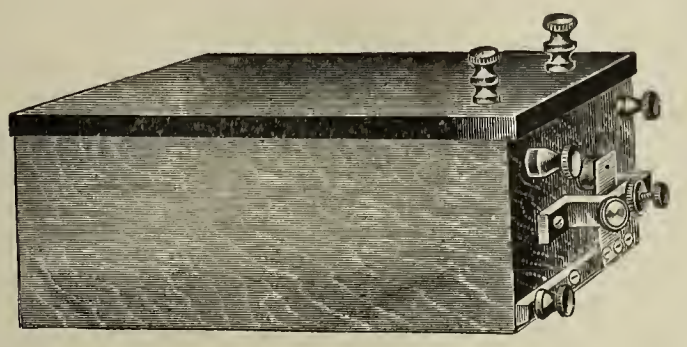
Balanced Duplex Uni-Spark Engine.

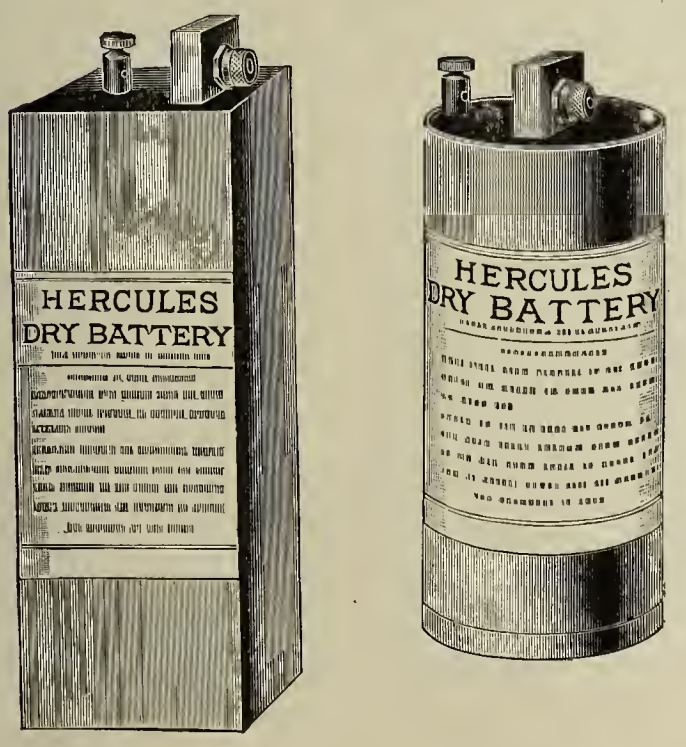


Duplex Reversing Engine.

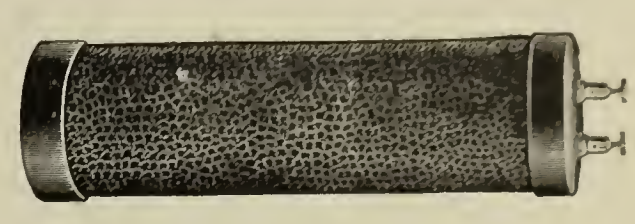
certain and instantaneous. In some cases where heavy current work is to be done portable primary batteries are employed. The automobile bells, representing two gongs mounted on a spindle struck by a single clapper, produce a pleasing musical sound; each gong is some tones higher than the other and an harmonious chord is produced in consequence. The gongs are operated by pressure of the foot, as in the case of the motorman's bell on the trolley car.

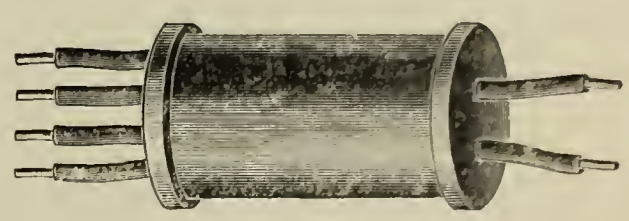
The engineer associated with this company is Walter K. Freeman, a man of reputation among the electrical community and well known to many outsiders.





Enclosed Spark Coil.s
Dry Batteries.







Wipe Spark Coil.
Special Waterproof Coil.
Gong Bell.

TECHNICAL TRADE JOURNALS.

The value of technical journals was never shown more forcibly than now, and there is no industry of any considerable importance that does not support one or more, and one can hardly meet a gathering of young workmen who do not talk over matters in connection with the technics of their trade, and criticise favorably or adversely articles that appear in the columns of their representative journal. These criticisms lead to study and the working out of problems that might not have been mentioned except by the workman who met trouble in his work, and then only thought of or considered except through compulsion, and forgotten when the trouble was bridged. All in the industries do not endorse trade journals; as a rule those who do not are divided into two classes, the careless, ignorant and indifferent workmen, and men who have nothing to learn, whether workmen or employers. The experience in carriage trade journalism is the experience in all industries. We have known manufacturers to write complimentary letters to publishers because of a four line item in which the manufacturer's name is mentioned, and overlook dozens of pages of practical and technical articles from pens of the most skilled in their line. Our personal experience has been that we have always received courteous treatment by progressive, wideawake manufacturers, and when criticised by them we never failed to get valuable food for thought. We have been ordered out of a shop where, in order to reach the office (?), we were compelled to climb over old wheels, diordered piles of lumber and scraps of all kinds, and to be told by the "boss" that "I won't allow yous' paper fellows to come here and pick craft." All are not that way, but the men, as a rule, who most antagonize trade journals, are those who show the least enterprise and have the most to learn, or those fairly successful ones whose self-conceit makes it impossible for them to be taught by anyone.—"The Hub."

NEW INCORPORATIONS.

Albany, N. Y.—The Ithaca Electric Company has been incorporated by Ithaca and Philadelphia, Pa., capitalists for $50,000.

New York City.—Messrs. S. G. Tracy, W. H. McIn-

Jersey City, N. J.—The Wisconsin River Power Company, wih head offices at 76 Montgomery street, Jersey City, has been incorporated by local capital at $2,000,000. The company's object will be the operation of a water-power plant for a supply of electricity for lighting purposes.

Gardner, Colo.—A new Denver corporation known as the Garner Electric Drill and Machinery Company, with a capital stock of $1,000,000, is said to have arranged for the purchase of property on which it will build a large electric plant for the manufacture of tools and machinery. The company will employ about 150 men at the start.

Phillipsburg, N. J.—The Washington Electric Light, Heat and Power Company has recently been newly incorporated and will be known as the Washington Electric Light Company, with a capital of $50,000, its new president being Abraham Nesbit, of Kingston, Pa., who is the president of a Pennsylvania bank and one of the directors of the Lehigh Valley Railroad Company.

TELEPHONE CALLS.

Monmouth, Ill.—Local capitalists have incorporated the Monmouth Telephone Company for $35,000 capital stock.

Anthony, Kas.—The Southwestern Telephone Company has recently been incorporated with $30,000 capital.

Yorkville, Ill.—It has been decided by the officials of the Northern Illinois Telephone Company to increase its capital stock to $250,000.

Selins Grove, Pa.—The Spring Telephone Company, running throughout the western part of Snyder County, Pa., has been bought by the Penn Telephone Company for $10,800.

Oakland, Neb.—A stock company has been formed at Bertha, nine miles distant from Oakland, to operate a telephone line between the two towns named. The company has been capitalized at $5,000.

Troy, N. Y.—Amended articles of incorporation have been filed by the Erie Telephone and Telegraph Company, whose lines will run between Troy and Cleveland, Ohio. The company is capitalized at $15,000,000.

Houston, Tex.—A recent incorporation is the Paris & Minter Telephone Company, of Pattonville, Lamar County, Tex., whose lines will run from Pattonville to Minter, in Delta and Red River counties. The capital stock is $2,500.

Albany, N. Y.—Local capital is back of the West Canada Telephone Company, of Vernon, which will operate telephone lines between villages in Herkimer and Hamilton counties. The new concern is capitalized at $3,000.

Conejos, Colo.—Coloradians have incorporated the Extension Telephone Company for $5,000, to operate lines in Conejos County. The lines in question are, by the terms of the charter, to be either erected by the company itself or purchased.

STREET RAILWAY NEWS.

Indianapolis, Ind.—The Union Traction Company has filed articles increasing its capital stock from $4,000,000 to $5,000,000.

Harrisburg, Pa.—A charter has been granted to the Elwood Car Company, of Elwood City, Pa., which is capitalized at $100,000 by Elwood City and other capitalists.

Elkton, Md.—The entire capital stock of the Cherry Mill, Elkton & Chesapeake City Electric Railway Company has been subscribed for by local capitalists and construction work will soon begin.

Berlin, Wis.—Incorporation papers have been filed for the Berlin & Northern Railway Company, which will be capitalized at $100,000, the directors being mainly Chicago capitalists. The road will be built from Berlin to Stephens Point.

Ripon, Wis.—A company known as the Ripon, Dartford & Green Lake Traction and Light Company has been incorporated with a capital of $100,000 to construct and operate a railway between the towns named and other local points in Wisconsin.

Parkersburg, W. Va.—Local capitalists have organized the Fairmont & Clarkesburg Electric Railway, which will operate both freight and passenger lines. Work is expected to begin within two weeks.

Oklahoma City, Okla. Ter.—Residents of Oklahoma and Indian Territories have recently been granted a charter for the Sulphur Springs Electric Railway Company, with headquarters in Oklahoma City and branch offices at other points. It is expected that the road will be 24 miles long and will cost about $250,000.

AUTOMOBILES.

Trenton, N. J.—Local capitalists have incorporated the International Motor Carriage Company for $2,000.

Cleveland, Ohio.—The Woodruff Motor Carriage Company has been incorporated by local interests at $50,000.

Springfield, Mass.—The Springfield Motor Vehicle Company has been incorporated for $50,000 and will shortly begin manufacturing.

San Francisco, Cal.—A recent corporation, which is known as the California Automobile Company, has been incorporated for $150,000, $25,000 of which has already been paid in.

NEW YORK NOTES.

THE NILES TOOL WORKS COMPANY, of Hamilton, Ohio, and New York City, announce that Mr. H. F. Frevert, formerly with the Garvin Machine Company, has associated himself with that company, and will be located at the general offices and salesrooms at 136 Liberty street.



WESTON STANDARD

PORTABLE DIRECT READING

VOLTMETERS

AND

WATTMETERS

For Alternating and Direct Current Circuits.

The only standard portable instrument of the type deserving this name.

Write for our Catalogue of Portable Instruments.

WESTON ELECTRICAL INSTRUMENT CO.,

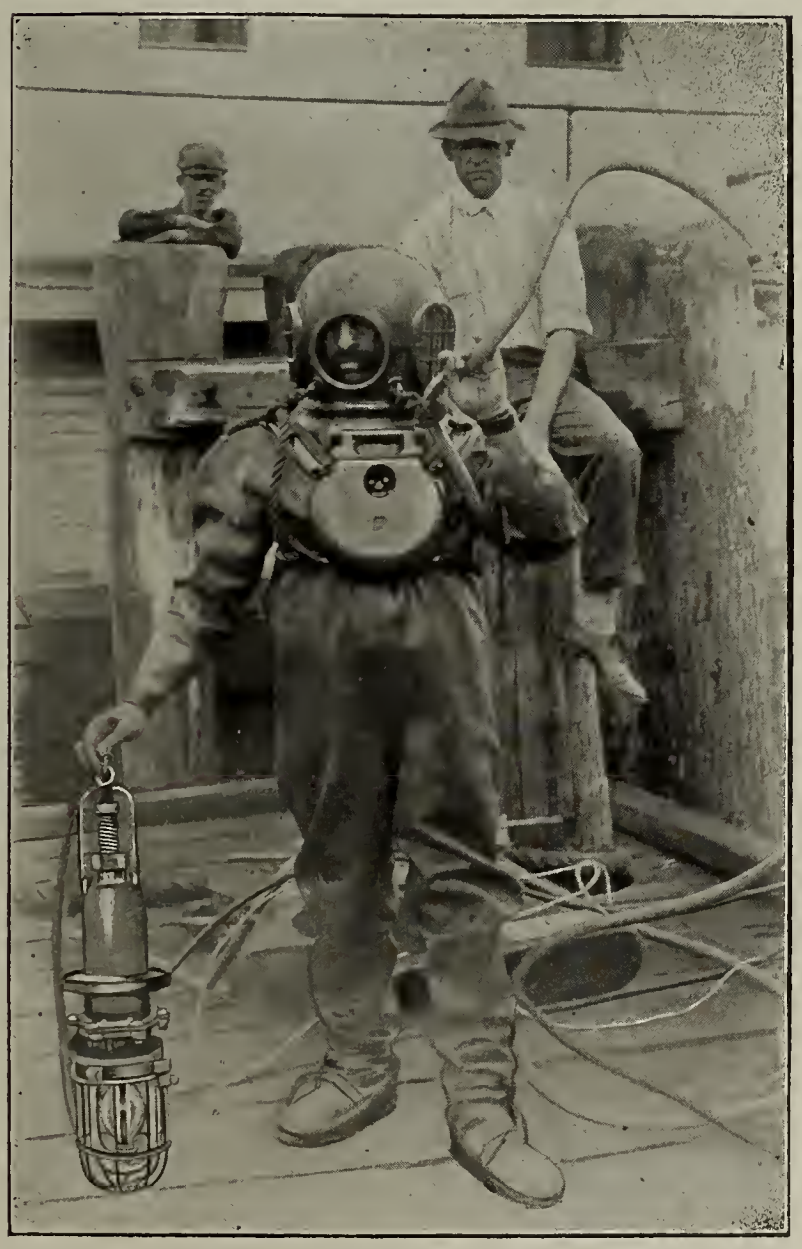
114-120 William Street, Newark, N. J.

BERLIN. European Weston Electrical Instrument Co., Ritterstrasse No. 89.
LONDON. Elliott Brothers, No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 20. NEW YORK, NOVEMBER 17, 1900. Whole No. 705.

Submarine Arc-Lighting.



Diver about to make a decent with Yale Submarine Arc-Lamp.

THE YALE SUBMARINE ARC LAMP.



THE Yale submarine lamp is an enclosed arc lamp, absolutely water tight, with both an inner and outer globe, the upper part of the outer globe being hermetically sealed to the metal cylinder containing the feeding mechanism by means of rubber gaskets and rings. The feeding mechanism in this lamp differs from that of the ordinary arc lamp in this respect, among others, namely: That it is enclosed in a water and air tight cylinder. From the top of the cylinder, through a carefully packed aperture, issue the two insulated wires, contained in a cable. The lower portion of the lamp is protected by an eight wire guard. By a special device the heat and gases of combustion are kept from entering the mechanism chamber and destroying the solenoid and other apparatus for regulating the feed of the carbons. The body of the lamp is made of gun metal, which will not corrode.

The chief difficulties encountered were in making the lamp waterproof, cooling the heated gas, relieving the high internal gas pressure, and causing the feed mechanism to work when the lamp is in any position, even inverted—if these difficulties could be overcome it would put the new lamp far ahead of its predecessors. The gas pressure is equal to several atmospheres, and in the first

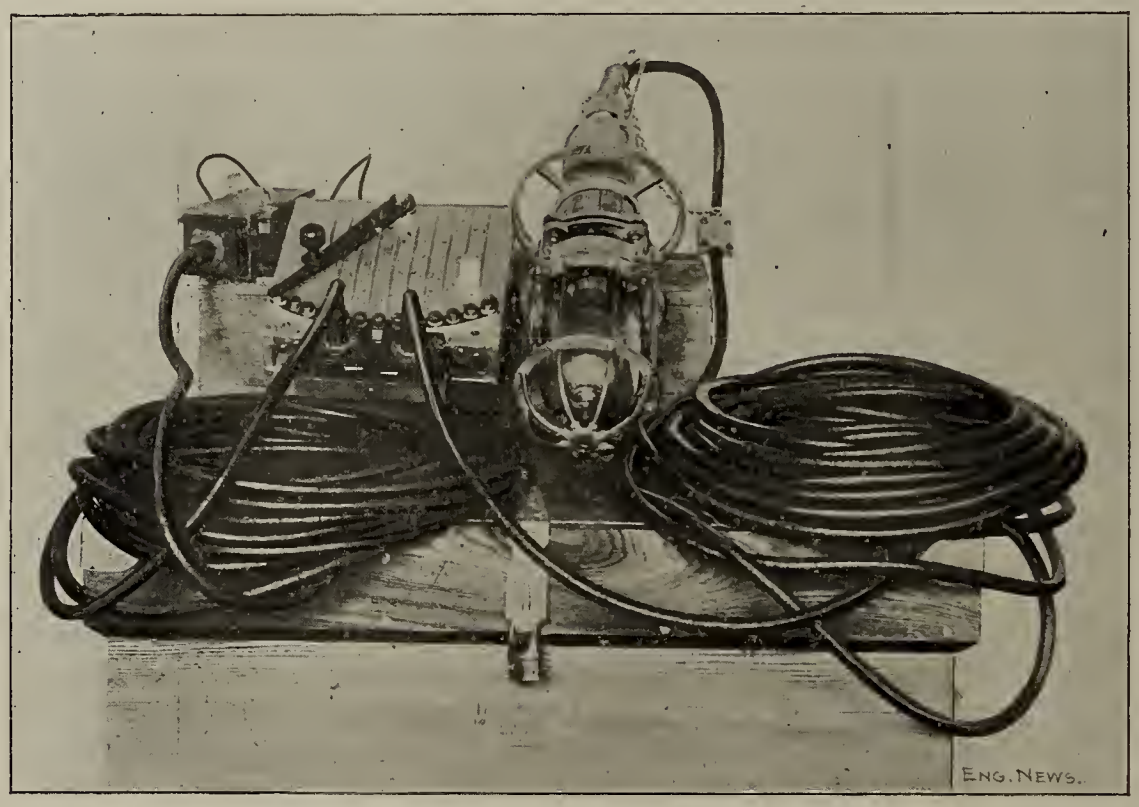
experiments the gas forced itself through the packing. This difficulty was met by a specially designed check valve. The heat of the arc is, of course, intense, and being enclosed in so small a space, with only a few inches of metallic surface exposed to the cooling effect of the water surrounding the lamp, the gas soon reached a temperature sufficient to destroy the solenoid, feeding mechanism, rubber gaskets and the packing.

When the lamp is burning in air the excess of heated gases of combustion and the internal pressure attendant thereon are relieved through the check valve, and also when the lamp is burning in shallow depths. When the lamp is lowered to greater depths, the pressure within is equalized by the external pressure of the water, and the lamp is in equilibrium inside and out. A lamp thus constructed will burn for any desired length of time. The lamp may be adjusted for any voltage; it is customary to burn it at 80 volts, at which it consumes from 5.25 to 6 amperes. An arc of very high candle power may be used to light up a large area and to enable divers and other marine investigators to carry on their work with far greater facility than heretofore. Although especially designed and adopted for submarine lighting this lamp may be used in the atmosphere with equally good results.

In operation the current is turned on and the light is lowered into the water. The waterpoof cable supplies current to the lamp and is attached to a special watertight plug and fixture on the deck of the vessel, or wherever it is desired to have the terminals of the lighting circuit. The whole lamp weighs, when submerged, but a few pounds and may remain suspended or may be carried about at will by the diver.

For the uses to which this lamp is primarily adopted a depth of sixty feet would rarely be exceeded. The difficulties to be overcome in making the lamp available for any depth—it is not yet possible for divers to work more than 200 feet below the sea's surface—are purely mechanical; hence it may not be unreasonable to expect to see it used in deep sea investigations, with an electrically controlled photographic camera. The possibility of increasing the power of the arc to equal that of the most powerful searchlight opens up a new and important field in connection with photography. Professor Louis Boutan, professor of zoology at the University of Paris, has made some interesting photographs of subaqueous scenery by the aid of a properly constructed camera, operated by him, in person, in a diving suit. Professor Bristol, of Columbia University, who experimented in Bermuda last summer, proved that submarine photography was practicable and opened up and extended a most interesting field, provided that proper lighting could be obtained below the surface.

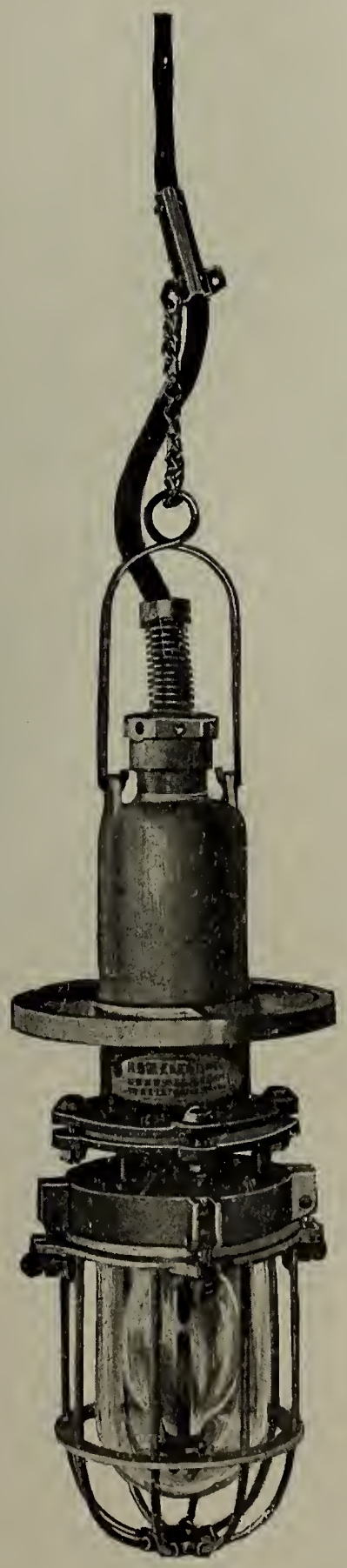
The several tests this lamp has had, go to establish the fact that it will in all probability revolutionize submarine work and, as mentioned above, open up the way for submarine photography. By the use of this light, wrecks can be lighted at a depth of 200 feet below the surface of the sea, so that a photograph can be made of a sunken ship at such a depth. The light has, at a depth of forty feet, a spherical lighting radius of about fifty feet. For twenty feet of this radius the light is strong enough for use in making a photograph. The lamp will be very useful to supplement the work of a diver going overboard from a damaged or leaking ship, as he could take a photograph of the injured part and bring the picture on deck for examination. The uses to which a lamp of this design may be put are many and varied and will occur to those interested in marine and naval matters. Among the possibilities mentioned are: examining and cleaning the bottoms of merchant and battle ships, attaching hoisting chains to guns and other movable parts on sunken vessels, placing and removing submarine mines, constructing bridge piers and coffer dams, for all kinds of pearl, coral and sponge fishing, and for all uses of submarine photography.



Yale Submarine Arc-Lamp Ready for Use.

In pearl fishing it is expected that the lamp will have a very extended use. Two prominent pearl fishers of the Paumotu Islands were in this country recently endeavor-

ing to secure air pumps, diving suits and other necessary apparatus to extend their business in the South Sea. Mr. Taiper, who is one of the most prominent fishers in the business, conducts his operations by means of divers sent down from a pearling ship. "We depend principally upon pearl-shells for our income," said he, "which, as



The Yale Submarine Arc Lamp.

crude shells, are sold at from $500 to $750 per ton, and there is always the chance that a diver may find a pearl of enormous value. Commercial mother of pearl is made from the shells that we deal in. When it comes to hunting for the real pearl there is not any kind of scoop or dredger that can take the place of men's eyes; diving and treading the deep is the only way to find valuable pearls. As a rule, these are some distance apart, scattered over the rocky bed of the ocean. Sometimes we pick up quite a fortune in a few weeks. What we need now is more light so that we can go deeper than is permitted by the light from the surface, which rarely in our waters exceeds thirty feet." There would appear to be an excellent opportunity for an American company to be formed to carry on operations of this nature.

The Yale lamp is manufactured by the Naval Electric Company, of 95-97 Liberty street, New York city, who also make and sell the "Naval" portable generating sets, portable marine arc lamps, and other electrical appliances for naval and marine use.

This company succeeds the B. & H. Electric Company, of Dansville, N. Y., and New Haven, Conn. It engages to furnish complete electrical installations aboard warships, cruisers, transports, torpedo-boats, submarine boats, ocean steamships, yachts, fire tugs, wrecking tugs, ferryboats, schooners, launches, etc. Installations have been approved by the U. S. Government and Board of Fire Underwriters.

TELEGRAPHING AND TELEPHONING SIMULTANEOUSLY OVER ONE LINE.

BY RICHARD GUENTHER.*

An article in the Elektrotechnische Zeitschrift discusses the progress made in the use of single lines for telegraphing and telephoning simultaneously. After describing the Rysselberghe system of attaining this end, and fully explaining the important part played by condensers, the writer describes a modification of the system recently introduced by the Telephone Works, Limited, of Hanover, which, it seems, has already been adapted to a number of large installations, including the Berlin fire-brigade service.

There are fifteen brigade stations in Berlin, each of which is served by a special network of fire alarms. From these stations underground wires radiate in all directions,, each wire being connected with a great number of alarm pillars. The alarms are arranged for automatic working, and to each is fitted a key for telegraping to the station. As it is, however, a very great advantage to be able to maintain during the progress of the fire, a good connection between the alarm pillars nearest the fire and the brigade station, exhaustive trials have been made with a specially adapted telephone constructed by the above mentioned firm, which have resulted in the general introduction of the same. To the Morse apparatus at the station a stand is attached, from which a microtelephone fitted with a battery switch and a second receiver are suspended. The remaining apparatus is inclosed in a flat box and placed under the table. This box contains an induction coil, a condenser, and a circuit key. As it would be expensive to equip each of the fire-alarm posts with telephone apparatus, a portable set is used, which may be attached to the posts by means of a plug and socket provided for the purpose. Such a portable set is carried by each of the brigade carts, there being some eighty now in use. The brigades' cycles are also equipped with sets which are very compact in design. Experience with the system has shown that the switching in of the telephone apparatus in no way influences the telegraph service. During simultaneous telegraphing and telephoning a slight knocking is preceptible in the telephone, which, however, does not destroy the audibility.

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*U. S. Consul-General at Frankfort, Germany.

The Automobile.

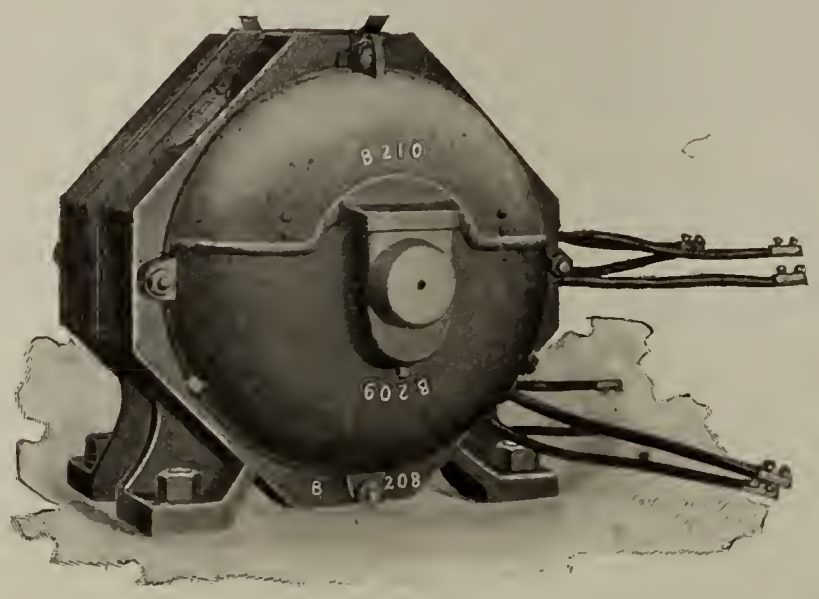
LUNDELL OCTAGON TYPE MOTORS FOR AUTOMOBILES.

Experience has demonstrated the fact that electric motors are the most satisfactory method of operating self-propelled vehicles. The electric carriage is the most convenient, the simplest, the safest and most desirable from all standponits. It runs smoothy and quietly and is easily controlled.

The Sprague Electric Company, whose reputation for building electric motors has never been surpassed, has designed new motors for automobiles that will meet the demands of the most critical manufacturer. These motors were designed under the personal supervision of Mr. Robert Lundell, the well-known inventor of electric motors, and the company is prepared to guarantee its apparatus to stand the requirements of the most exacting conditions.

The same care that has made the reputation of the Lundell motors has been used in the selection of material and the construction of each detail, which, combined with the correct principle of design, has produced a motor that is compact, reliable and unequaled for efficiency.

The Lundell octagon type motors, herewith illustrated, are designed especially for automobile service, and are perfectly rigid and free from rattling or shaking of parts due to vibration. They are made for either single or double motor equipment, as may be desired. In the single equipment the motor having a double commutator is used, while the double equipment takes two motors each with a single commutator, the idea being to use two commutators to each vehicle.



Lundell Octagon Type Automobile Motor.

The motors are usually wound for 80 volts, but can also be wound for other required voltages.

When the octagon type of motor is used in connection with different apparatus (other than automobiles) it is ordinarily furnished with feet as shown in cuts and in the diagram.



Vehicle Equipped with Lundell Octagon Type Motors.

The feet, however, are dispensed with for autmobile work and the end castings are furnished instead, with lugs or bearings to suit the style of suspension and running gear.

These motors are entirely enclosed, but have removable covers over the commutator. They are practically

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NEWTON HARRISON, E. E. Editor.

Walter Mueller, Managing Editor.

ASSOCIATE EDITORS.

Electric Light and Power.

Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.

Electro-Therapeutics.

Joseph Muir, M. D.
Frederick Strange Kolle, M. D.

NEW YORK, NOVEMBER 17, 1900.

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AUTOMOBILES AT THE GRAND CENTRAL PALACE.

The exhibition of automobiles at the Grand Central Palace opens up under the happiest auspices. The election troubles are over and the firms engaged in the manufacture of this class of vehicles can devote their entire minds to the duties before them. The interest taken in automobiles in the East is growing with tremendous rapidity and it seems as though the orders coming in to manufacturers will tax the capacities of their plants to the utmost. There are few, if any, industries that have opened up with such prosperity from the start as that of the manufacture of automobiles. Their construction and design calls for an aesthetic taste as well as a mechanical and electrical knowledge of a nature quite unique. The vehicles purchased by the upper stratum of society call for entirely different designs from those built for practical commercial purposes. At the Palace Show the light runabout is shown side by side with the auto-truck, the magnificently equipped barouche on the same floor with the dos-a-dos. In each case the controlling mechanism and the devices employed in general must be designed so as to suit the taste of the purchaser. The Palace Show, under the management of Mr. Marcus Nathan, is a pronounced success and is the first of its kind to be managed by him.

EDISON AND VILLARD.

The career of Thomas A. Edison, like that of many other great men, began under circumstances that called for all the strength of character that a man might possess. Aside from Mr. Edison's fame as an inventor, one of his greatest personal characteristics is the bull-dog tenacity with which he clings to his purpose until it is accomplished. It might be that among men who have risen to fame and prominence the one thing that brings them all together, that establishes a brotherhood among them, is that of invincibility of purpose. Henry Villard, the financier and railroad magnate, who died November 12th, was connected with Mr. Edison in his early experiments in a financial capacity in 1890. It may be said that through his aid to Edison and due to his personality much of the inspiration which led Edison to make his greatest successes came from him. This association between the two men has existed for many years and in all probability the inventor feels with great keenness the loss of his early friend.

THE DEATH OF THE "COPPER KING."

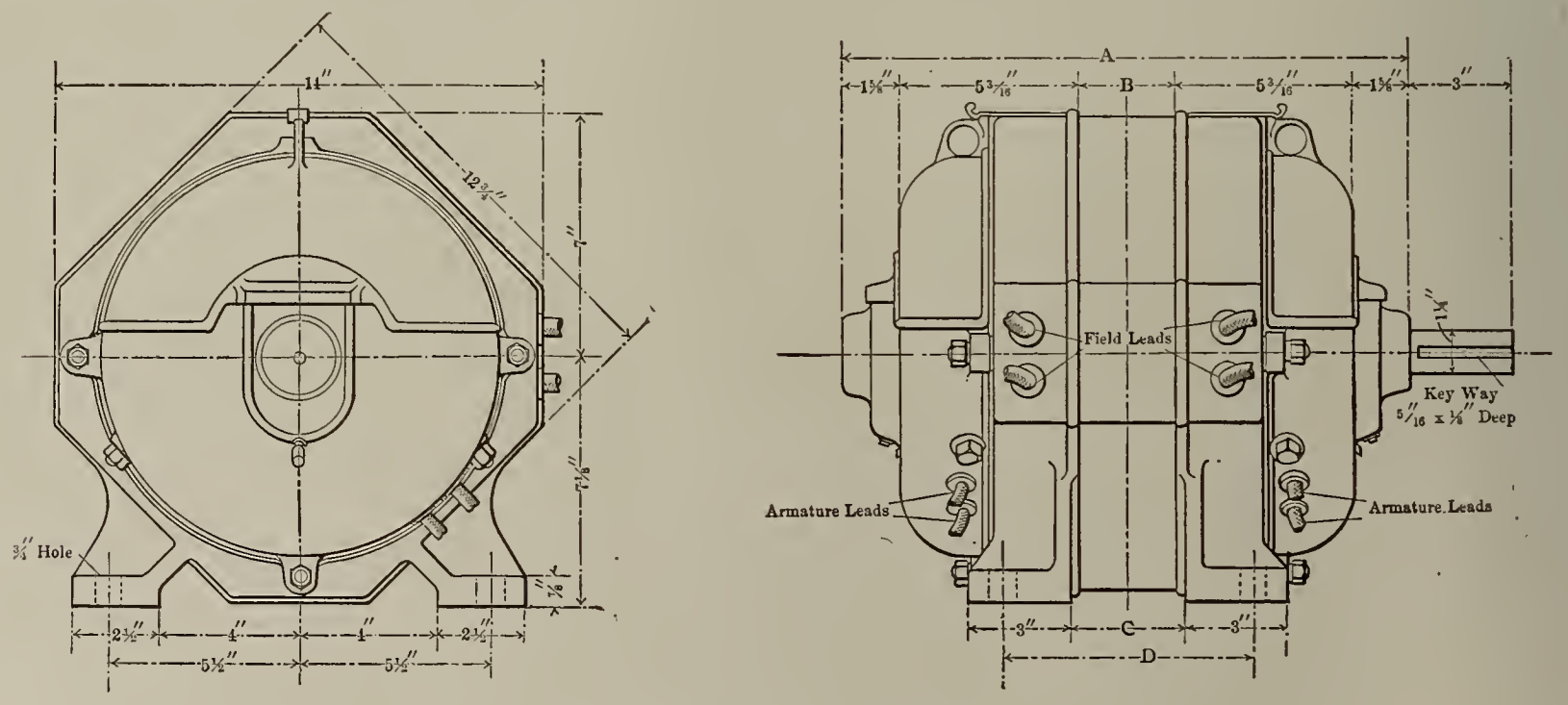
Marcus Daly, the "Copper King," whose recent death has been noted in the newspapers, was one of the most remarkable characters in the West. It might be said that he grew up with the electrical industry and through his keenness and foresight the mining interests of this country with respect to copper attained dimensions of the greatest magnitude. Marcus Daly, as head of the Anaconda copper mine, displayed a spirit of enterprise that is more than interesting to the electrical fraternity. The Anaconda mines are practically the richest in the world and they have become so largely through the introduction by Mr. Daly of electrolytic processes for the refining of copper; 1880 is not so far away, yet at that early date Daly began his career as a financier in connection with the mines of which we speak. The electroplating vats in the Anaconda mines are gigantic and produce annually thousands of tons of copper. The refuse or sludge falling to the bottom of these tanks provides enough money in the way of gold and silver to practically pay the running expenses of the plant, leaving the copper largely profit. Mr. Daly's interests exceeded twenty million dollars when he died, which is doing pretty well in twenty years' time. The copper interests in the United States bear the same relation to electrical progress as the steel trade does to the general prosperity of the country. Through Marcus Daly and his ten thousand employes pure copper was produced in large quantities with the greatest rapidity. The large wire manufacturing concerns were able to meet conditions of their business with ease through the readiness with which copper ingots could be obtained. On the other hand, they were able to turn out a much better quality of wire due to the purity of the metal put out by the Anaconda mines. This mine, so self-contained, having its own smelters, coal mines, saw mills, etc., is entirely a piece of Daly's handiwork. He might be classed with such men as Huntington, Rockefeller, or his ancient enemy, Clark.

dust and water proof and invulnerable to accidents or injuries.

A controller especially designed by the Sprague Electric Company enables the operator to have perfect control of the vehicle at any time, and will withstand the hard usage resulting from frequent starting, stopping and heavy overloads. The matter of overloads has been carefully considered, enabling the motors to respond to a demand far in excess of their rated capacity without injurious heating or sparking.



Lundell Octagon Type Motors Attached to Vehicle.



Lundell Octagon Type Motor.

FEATURES OF CONSTRUCTION.

Field Magnet.—The entire field magnet with exception of the pole tips is made of laminated sheet iron. The pole tips are made of cast iron for the purpose of gradually reducing the magnetic lines of force at the pole corners. They also serve the purpose of holding the field coils securely in position.

Armature.—The armature core is built up of soft iron laminations of high magnetic quality, secured to a spider and shaft of extra strength. It is of the slotted drum type. The armature conductors are firmly held in the slots and consist of form wound coils of rectangular copper wire reliably insulated.

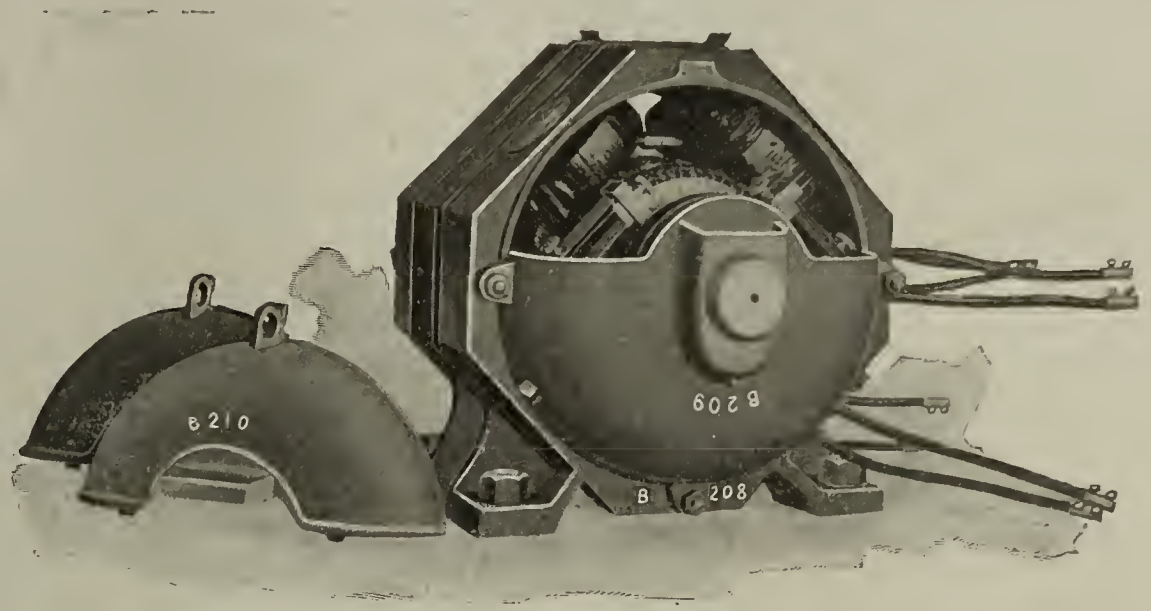
Commutator.—The commutator is built up of the best grade of copper bars and mica insulation and its construction provides exceptional solidity and true running qualities.

Brushes and Brush Holders.—Strong and rigid rocker arm and brush holders are provided for radial carbon

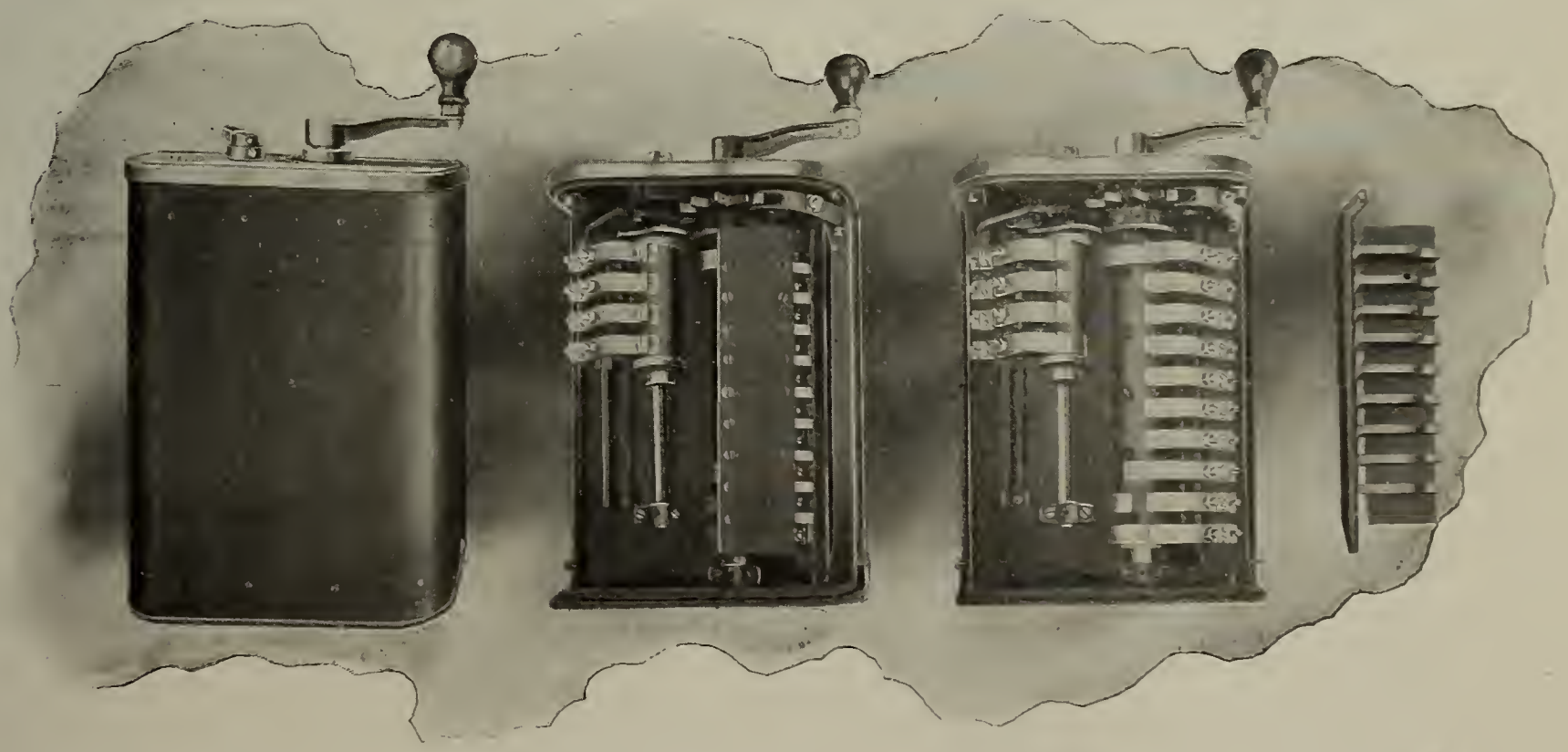
brushes which are clamped to the holders and remain immovable under excessive vibration. The brushes and brush holders are easily accessible for adjustment by removal of covers.

General.—The entire construction is according to the best design of street railway motors and is entirely safe for extraordinary service. The running qualities are of the highest order—low temperature for intermittant service—no sparking—safe for heavy overloads; all resulting in satisfactory and reliable results to the user and very low depreciation.

The Sprague Electric Company, knowing full well the importance of the superior qualities of this class of apparatus, invites all manufactures of electric vehicles to investigate its merits. All inquiries will receive prompt attention.



Lundell Octagon Type 4 Pole Motor-Open.



Exterior and Interior Views of Lundell Controller with Separate Reversing Switch for Large Automobile Motors.

THE AUTOMOBILE CLUB'S BANQUET.

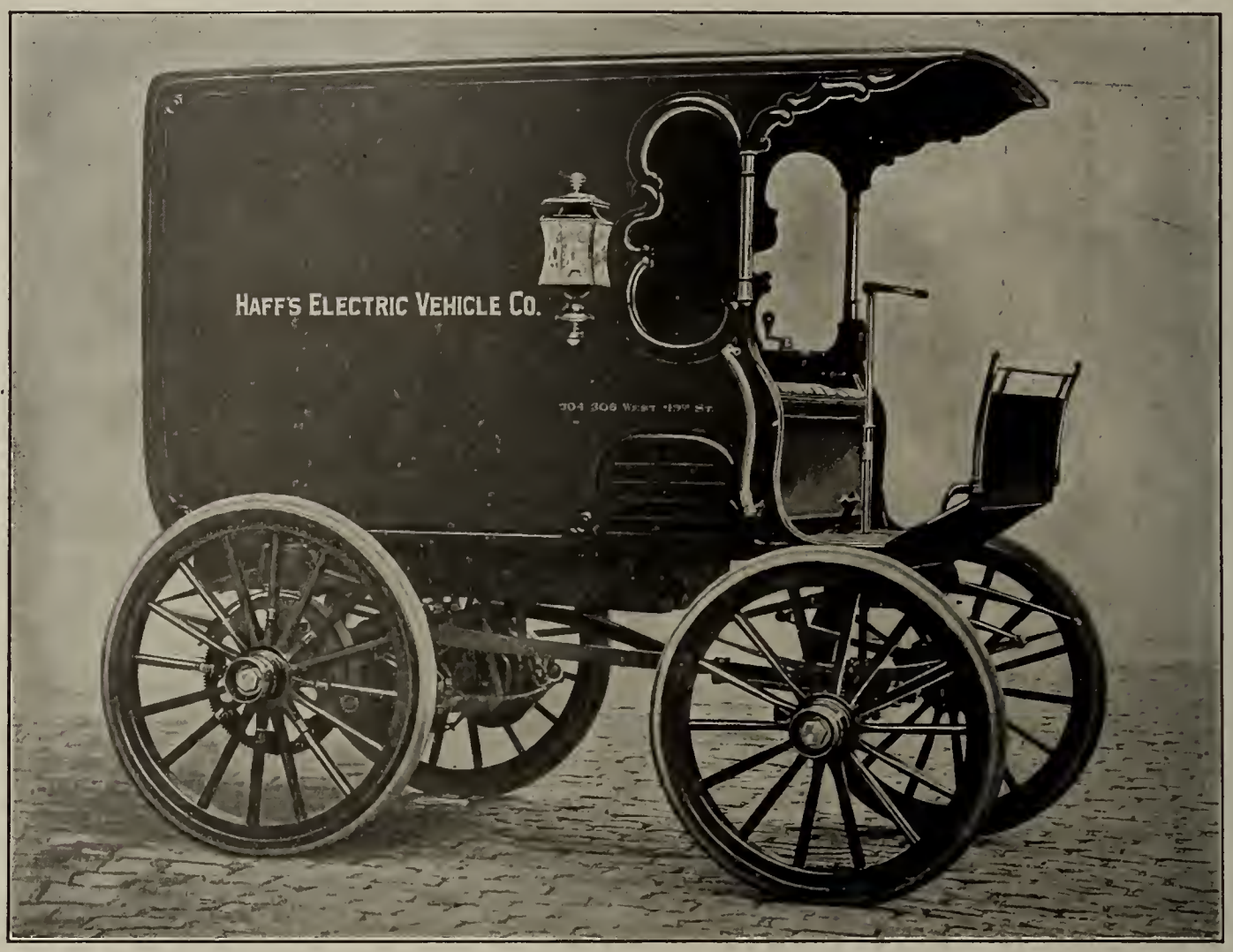
At the dinner of the Automobile Club given to exhibitors at the Madison Square Garden Automobile Show, on Friday evening, November 9th, there were about 200 guests and some of the speeches had points of much interest. Prof. R. H. Thurson, of Sibley College, Cornell University, said that such a club had been needed for 2,000 years, and then proceeded to a historical recital of the attempts toward automobilism. He said that Isaac Newton in 1680 had planned an "auto" and that in 1707 a halfway practical one was made in France. In 1830 the subject of motor vehicles for the road was again brought forward in France, but legislation defeated it. The English Parliament in 1833 appointed a committee to investigate the matter of automobiles and that committee reported that practical machines could be made to run twenty-five miles an hour. A vote in the House of Lords, however, decided that such machines must not have roadway privileges.

Taking the steam engine and the American automobile of 1880 as prototypes he then traced the history down and predicted a time when Broadway would be paved with iron plates and the horse would be unknown.

It was a peculiar feature of the dinner that there were loud cries of "No, no!" against every one who talked abou the possible extinction of the horse. Former acting president, George F. Chamberlain, drew applause by referring to Vive-President A. E. Bostwick, who presided, as a man who not only was setting a pace in the automobile game, but one who also had twenty-six entries in the "haymotor" show that begins in Madison

Square Garden on Monday, November 19th. The most eloquent speaker was Arthur J. Eddy, president of the Chicago Automobile Club. Jefferson Seligman, while the dinner was in progress, remarked that the first show here surpassed the last year affairs in London and Paris which he attended.

some interesting comparisons between the quadruped and motor propelled vehicles. The Horse Show following includes not only the foremost New Yorkers, but the 50,000 visitors from out of town who annually attend this function. The Automobile Show management has made elaborate preparations to bring these visitors



Electric Vehicle Equipped with Lundell Motors. (See pages 176–179.)

THE GRAND CENTRAL PALACE AUTOMOBILE SHOW.

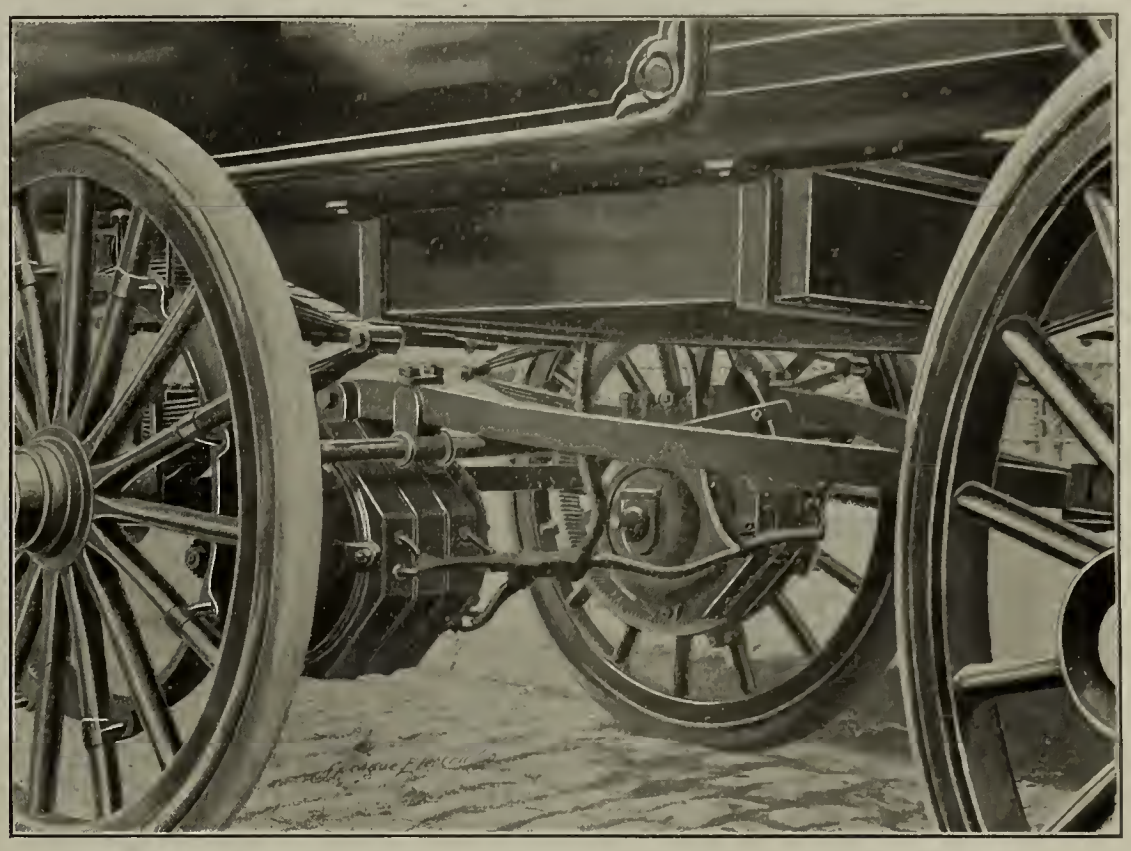


THE Automobile Show, which opened at the Grand Central Palace, New York city, on Wednesday evening, November 14th, although coming close on the heels of the successful Show held at Madison Square Garden during the previous week, promises to eclipse even that successful affair, both as regards attendance as well as interesting features. The Horse Show at Madison Square Garden will give the "horsey" set an excellent opportunity to compare the latest rigs shown there with the newest types of motor vehicles and the chauffeurs and their horse loving brethren will be able to make to the Palace, and judging by the turn-out on the opening night their calculations have proved correct. Charging stations have been installed and electric current is furnished free of charge for charging vehicles. In this way exhibitors are enabled to display their models on the street during the morning hours when the show is not open. The management has planned a very liberal advertising campaign, consisting not only of newspaper advertising, press notices and attractive posters, but also a system of correspondence and circulating direct to users and possible users of automobiles within a radius of a hundred miles. The export trade, most of which is practically controlled in New York city, has also been fully covered and no stone has been left unturned to make the show a paying investment to exhibitors. The grand central track on the main floor allows vehicles to be shown in full motion and day and night there is constantly circling streams of vehicles, each one trying to outvie the other in speed and ease of manipulation.

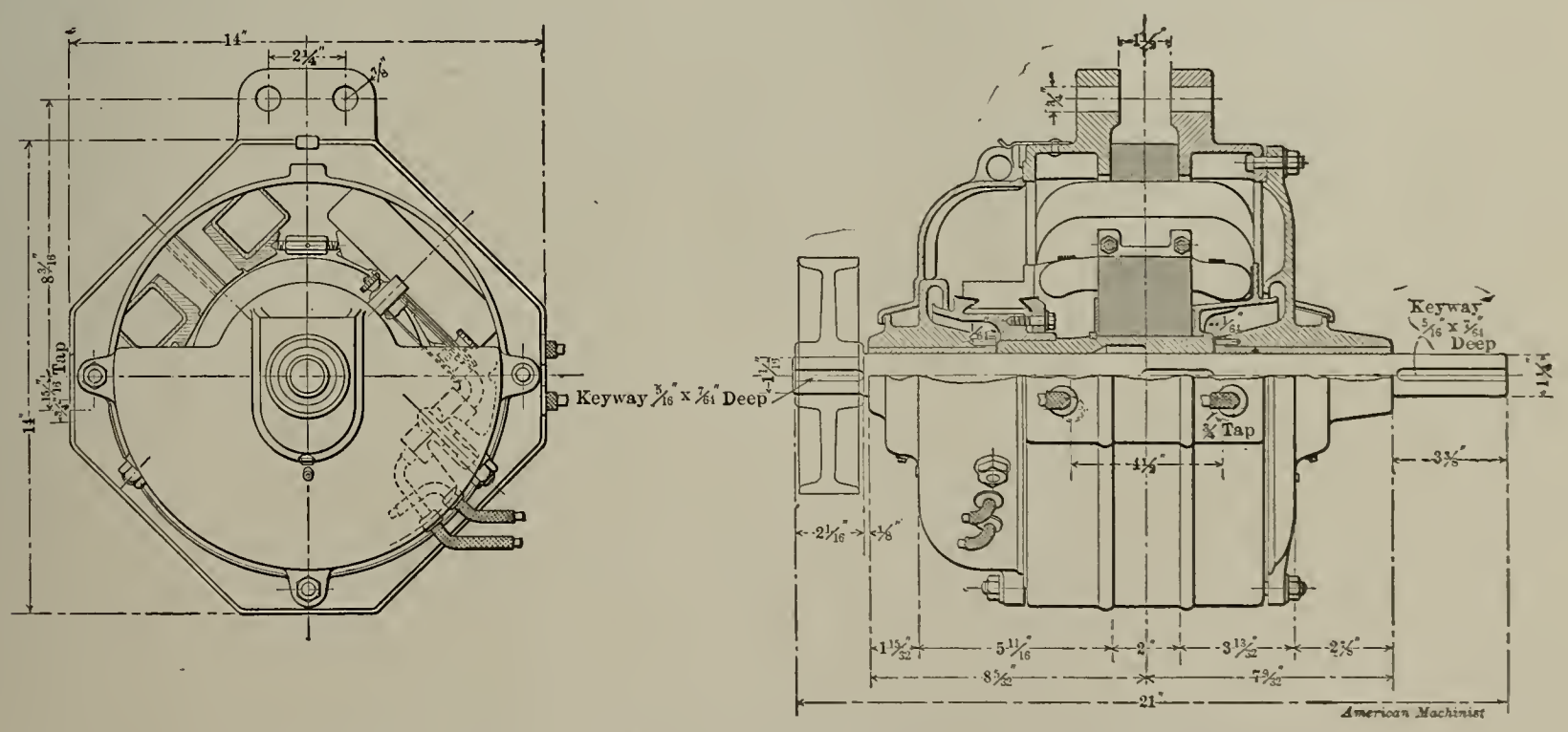
The departure of the last visitor from the Automobile Show at Madison Square Garden, which closed on last Saturday night to make way for the Horse Show, was the signal for the departure of the exhibits. Beginning at ten o'clock Saturday night, and continuing all day Sunday, there was a stream of vehicles issuing from the Garden gates and leading to the Grand Central Palace, which fills the block bounded by Lexington avenue, 43d street, 44th street and Depew place. There elaborate preparations for the ten day show, which opened on

Wednesday evening, November 14, and continues its daily sessions from 10 a. m. to 11 p. m., were progressing rapidly.

The Palace Show is not a dull duplicate of the Garden Show. It is distinctly new. It affords room for many manufacturers not represented at the Garden and they have secured places for vehicles that are on view for the first time. The Palace exposition is larger and more complete than its predecessor. Its arrangement is in marked contrast to last week's exhibition, where the principal exhibits were placed within the track, thereby obscuring the view of the moving vehicles to an extent. At the Palace the track is the central feature, occupying the entire auditorium, and the exhibits are distributed around the track, a wide aisle intervening. A clear view of the entire track circuit is obtainable from two commodious balconies of the auditorium. The space within the track is reserved for exhibitions of expert handling of automobiles. The track is made of double flooring, smoothly planed and closely fitted, no nails being used in its construction, all joints being fastened with screws. This makes the track as smooth as a park boulevard. Landing stages, aside from the direct track, are provided to enable passengers to be taken on and off the vehicles without delaying those in motion.



Lundell Octagon Type Motors attached to Vehicle. (See pages 176-179.)

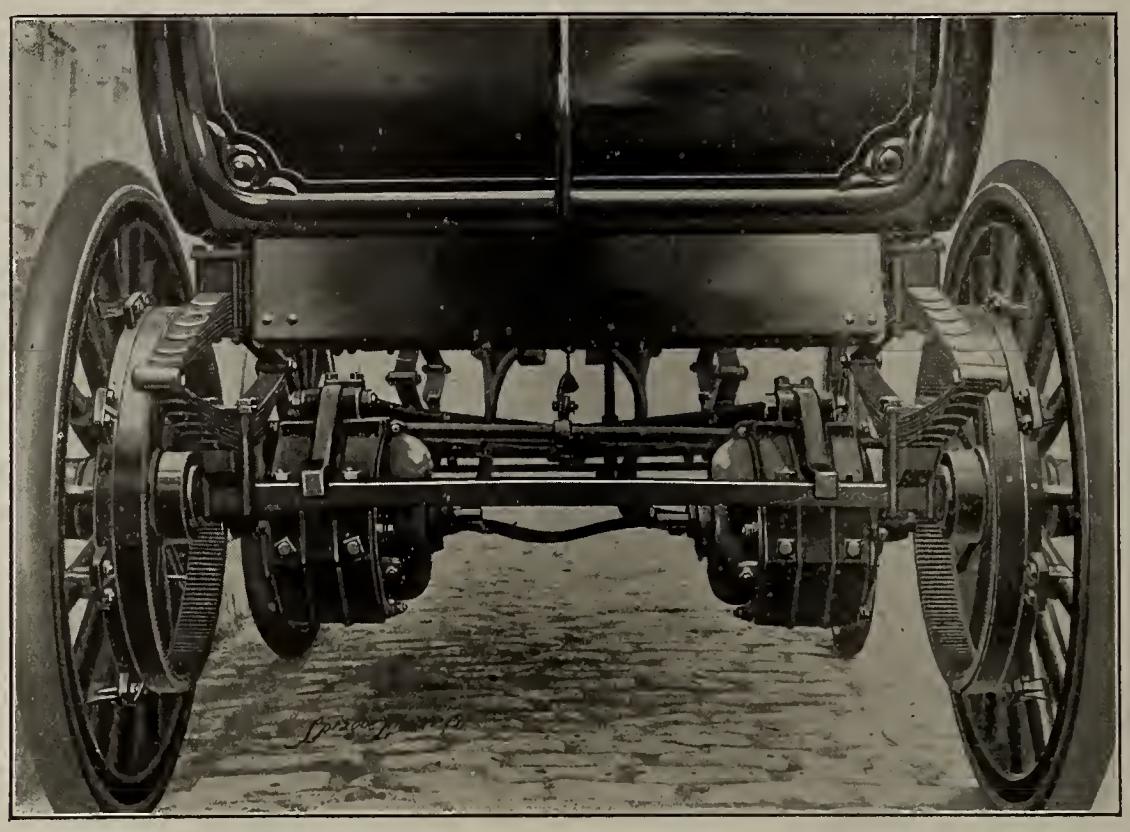


Lundell Octagon Type Motor—Single Commutator. (See pages 176-179.)

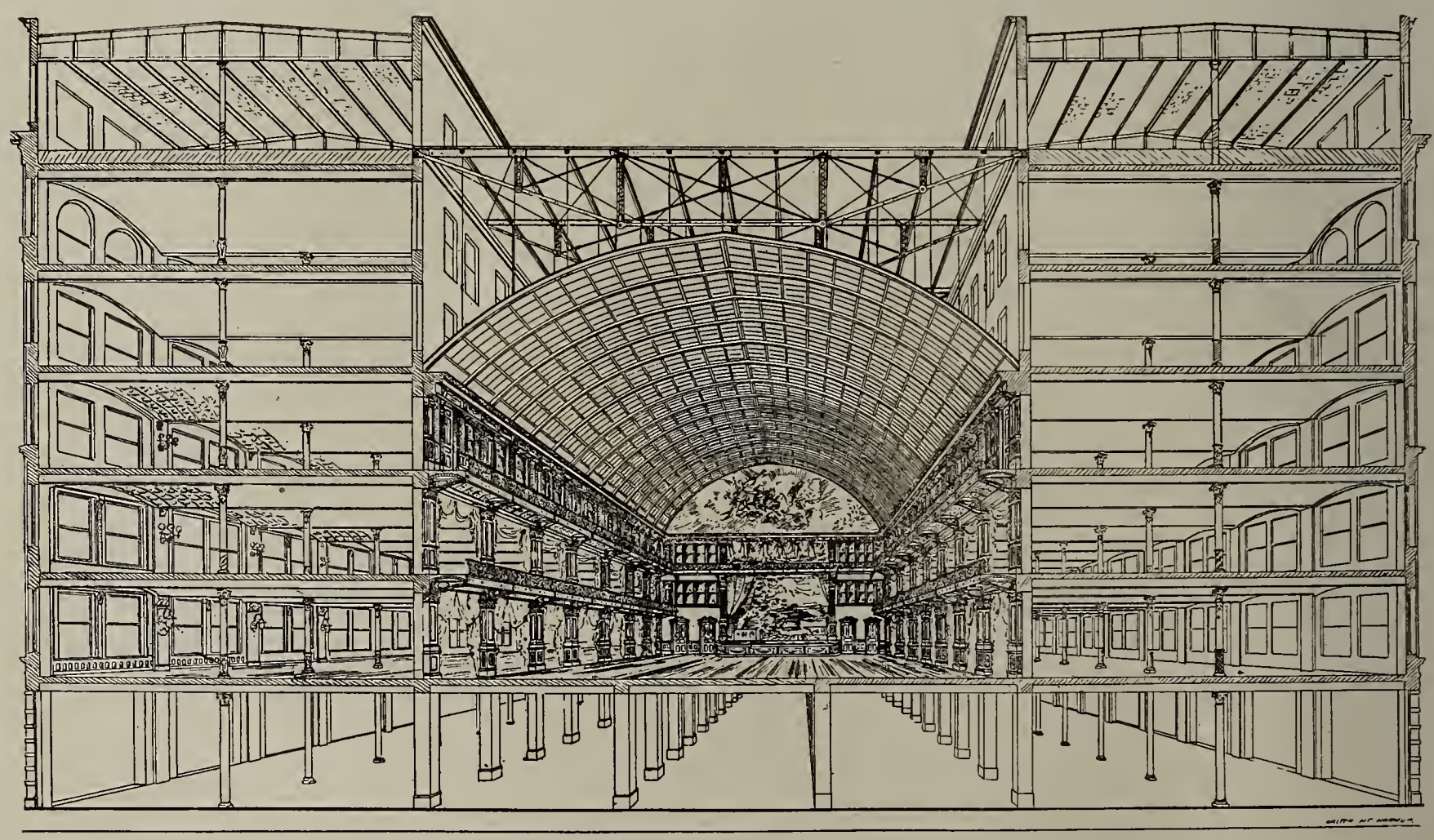
Features of the daily programme include afternoon and evening concerts by the famous Old Guard Band. All contests have been arranged by and are being conducted under the direction of a committee of the manufacturers exhibiting. The hall itself, occupying an entire

city block, is beautifully decorated and illuminated, making the exposition a very attractive spectacle.

The exhibitors, exclusive of the later arrivals, include the American Electric Vehicle Co., New York; American Roller Bearing Company, Boston, Mass.; Buffalo Electric Carriage Co., Buffalo, N. Y.; Baldwin Cycle Chain Co., Worcester, Mass.; Canda Manufacturing Company, New York; Cooke Locomotive & Machine Company (Thornycroft Steam Truck), Paterson, N. J.; DeDion-Bouton Motorette Co., Brooklyn, N. Y.; Dayton Electrical Mfg. Co., Dayton, Ohio; Denison Electric Engineering Co., New Haven, Conn.; C. J. Downing, New York; Electric Vehicle Company, New York; Gleason-Peters Air Pump Co., New York; Gray & Davis, Amesburg, Mass.; Holyoke Automobile Co., Holyoke, Mass.; Hartford Rubber Works Co., Hartford, Conn.; Janney,



Lundell Octagon Type Motors Attached to Vehicles.



Sectional View of Grand Central Palace Where the Automobile Show is being Held.

Steinmetz & Co., Philadelphia, Pa.; Knox Automobile Co., Springfield, Mass.; Locomobile Co. of America, New York; Lehman Bros. (Carriage Heaters), New York; Maryland Automobile Mfg. Co., Cumberland, Md.; Marlboro Automobile and Carriage Co., Marlboro, Mass.; Mobile Co. of America, Tarrytown, N. Y.; New Haven Carriage Co., New Haven, Conn.; Overman Automobile Co., New York; Oneida Automobile Company, Oneida, N. Y.; Standard Auto & Vehicle Co., Boston, Mass.; Strong & Rogers (Electric Vehicle), Cleveland, O.; E. R. Thomas Motor Co., Buffalo, N. Y.; Tripler Liquid Air Company (vehicle propelled by liquid air, first time shown to the public), New York; Woods Motor Vehicle Co., Chicago, Ill:



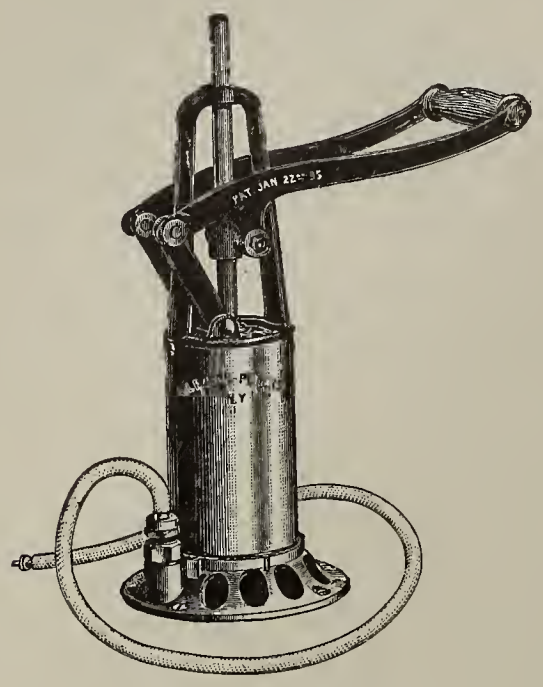
A Battery of Storage Cells.

THE CHARGING OF STORAGE BATTERIES ON A LARGE SCALE.

The difficulties attending the use of the storage battery in times gone by have been removed through a change in the methods of handling it. The storage battery of to-day is constructed on mechanical and electrical lines for the purpose of securing staying power and solidity. The storage batteries of a decade ago were exceedingly light in weight, faulty in construction and efficient only for a limited period of time. The thorough experience in the handling of storage batteries has its benefits, as shown by the progress made by the builders of electric automobiles. In this case, where the storage batteries are carried in a comparatively light vehicle, though largely protected from serious jolts, good mechanical construction is absolutely essential. Weight, of course, enters into the problem to the extent of from half a ton to a ton and a half, as far as the batteries are concerned. In large installations, where cab service is carried on on a large scale, storage batteries are placed in a well ventilated and well illuminated room. Here the charging is carried on, the batteries being regularly inspected and systematically tested. The positive plates, which fail more rapidly than the negative and fall into a decayed condition eventually, are removed when in this degenerate condition and new ones substituted. The cells, through this process of examination, in addition to the care taken during charging, are able to withstand the severest tests without injury. Through this process, involving care and individual attention, the storage batteries employed for automobile service are made to last a much longer time than would otherwise be the case. In fact, it has been estimated that the saving represents from twenty to forty per cent. of the original cost of the batteries.

THE GLEASON-PETERS AIR PUMP.

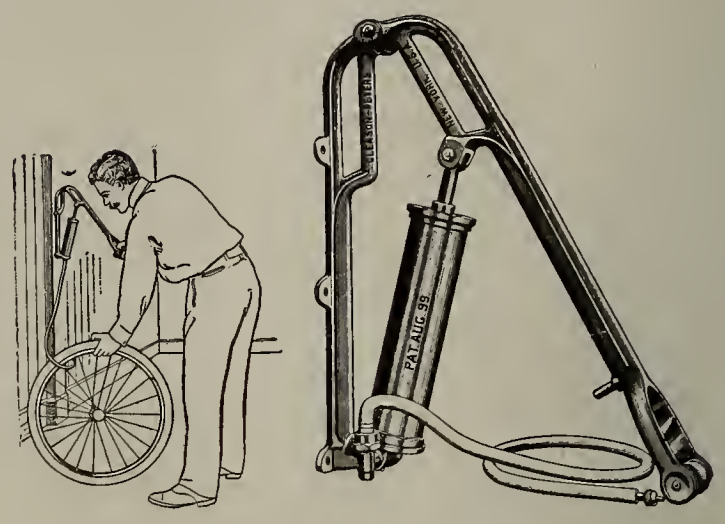
The pump illustrated in these columns finds one of its most useful applications for automobile service. It may be used for a variety of purposes, experimental and practical.



No. 4 Lever Pump.

The No. 4 lever pump, shown in cut, is excellently constructed, the yoke fitted with a bronze metal bushing whcih acts as guide to the plunger rod, keeping it central and the cup-leather in the proper position. The other parts, such as the levers, links and crossheads are of malleable iron. This air pump is one of the most solidly constructed of its kind on the market.

The No. 97 stationary pump for heavy automobiles or trucks, is made from malleable iron. The smaller sketch shows its application when attached to the wall. The best results are obtained with this pump through the employment of the toggle joint principle as the piston finishes its stroke. This nickel plated and well constructed pump is made from heavy, seamless brass tubing; has a ½ inch steel plunger rod and a heavy cast bronze cap and base. In addition, it is provided with extra heavy packed sole-leather washers.



No. 97 Stationary Pump.

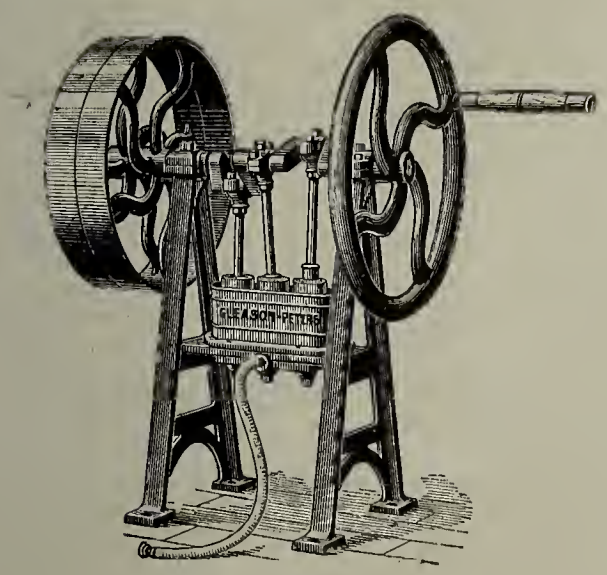
The No. 20 triple cylinder Gleason-Peters pump is the most economical air compressor made. Little power is required as the three cylinders produce a very high pressure through their small diameters. Each cylinder is bored from solid brass and is provided with independent intake and outlet valves and the most improved type of piston washers, fitted carefully by hand; these pumps are therefore of the highest order in the line of mechanical



Storage Battery Charging Station for Automobiles.

construction, are efficient and may be run either by hand or counter shafting at a speed of from 60 to 90 revolutions a minute.

In figure 118 a pump and motor are shown, the pump being belt driven. It consists of a geared triple cylinder pump and platform and upright for mounting motor so that pulley on motor is directly over pulley on pump. The motor is of 1-3 horse power, approximately, and will do all the pumping required with little or no attention. The above concern will attach the pump to any motor desired without additional expense.



No. 20 Triple Cylinder.

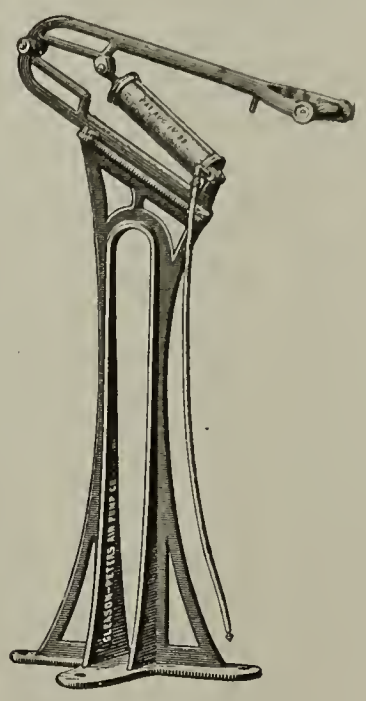


Fig. 114.
For Extra Heavy Tires needing very high pressure.

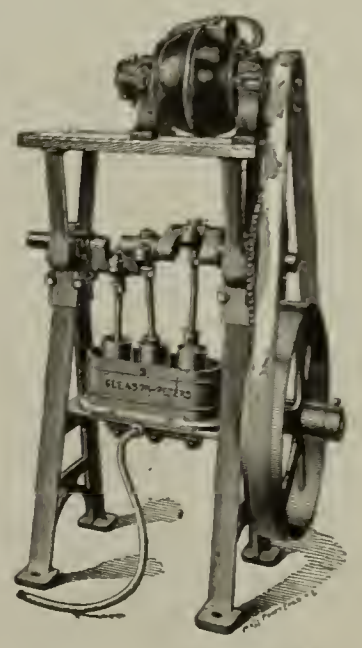


Fig. 118. Pump and Motor.

In figure 114 a pump is shown which represents one of the most powerful hand air pumps in the world. It is practically the pump represented in No. 97, mounted upon a cast iron stand two feet in height. The pump is placed beside the wheel to be charged with air. It can be easily moved about and is set at such an angle that all the energy of a man can be put into it.

The above concern are at the corner of Mercer and Houston streets, New York city, and their pumps are well known in the industrial world and to automobile people particularly.

Obituary.

DEWITT C. BUNNELL.

DeWitt Clinton Bunnell, son of the late Jesse H. Bunnell, died Sunday morning, Nov. 11, at half past two. During his trip to Minneapolis, Detroit and Pittsburgh, to attend the meetings of the Old Time Telegraphers, U. S. Military Corps, Railway Telegraph Superintendents and Municipal Electricians, Mr. Bunnell contracted typhoid fever which developed into pneumonia with fatal results. Being an athlete of magnificent physique he, up to the very last, expressed his assurance that he would recover, although having a very bad attack.

Mr. Bunnell was born in Brooklyn twenty-four years ago and received his education in that city and also at the Norwalk Military Academy, at Norwalk, Conn., from which he was graduated. In 1898 he went to South Africa, and after his return entered his father's business, J. H. Bunnell & Company. After his father's death Mr. Bunnell, in company with his brother, Jesse H. Bunnell, Jr., and A. J. Wise, his brother-in-law, incorporated the Bunnell Telegraphic & Electrical Company, of 110-116 Beekman street, New York city, manufacturers of telegraphic and electrical supplies, and was elected secretary. Although only organized during the early part of this year the company, under the active and able management of Mr. Bunnell, has already attained a firm footing and established an excellent name for itself. As a mark of his ability and untiring energy Mr. Bunnell could leave no better monument than the above company. He leaves a mother, two sisters, Miss Edith Bunnell and Mrs. A. J. Wise, and Jesse H. Bunnell, Jr., his brother.

Mr. Bunnell's kindly disposition made him friends wherever he went and throughout the trade there was no better liked young man than he. He was extremely popular at the conventions he attended and the many friends he made are shocked at his untimely demise and have overwhelmed his family with expressions of their sympathy.

MARCUS DALY.

Marcus Daly, perhaps the most picturesque of the "copper kings" of this country, died after a long illness at Hotel Netherland, New York city, Monday, November 12th.

Marcus Daly was a native of Ireland. Born in Bally Jamesduff, County Cavan, near County Meath, in 1848, he came to this country when he was between 8 and 9 years old. He frequently remarked to his friends that the only aids to fortune with which nature and his parents supplied him were grit and good health. He lived in Brooklyn for a few years after he came to this country and was employed as errand boy in a manufacturing establishment there.

Imbued with a spirit of adventure and a desire to test the opportunities afforded in an undeveloped country young Daly went to California in the early '50s. He had no sooner set foot in California than he bought a miner's kit, spending for it about all the money he had left and

struck for the mines. He got a job at the first mining camp he struck. He didn't make much money, but he didn't complain. He worked on and gained experience, which was what he wanted just then more than money. It was not long before he knew all there was to know at the time about the actual work of mining, and he had also acquired some ability as a prospector. Finally he started out on his own hook, prospecting wherever he thought he might find gold. He never struck anything very rich, but in the course of a few years he had gained the reputation of being one of the best judges of mining properties in California and Utah. He had also made valuable acquaintances.

Daly went to Montana from Utah in 1880. He then represented J. B. Haggin, Lloyd Tevis and George Hearst, of California, in whose mining schemes he had a small working interest. His principals controlled the Anaconda copper mines, and Mr. Daly put his heart into the development of those properties. He constantly increased his interests, which within twenty years were estimated to be worth at least $20,000,000. The Anaconda with its mines in Butte, its smelters at Anaconda, its sawmills in the western part of Montana and its coal in the eastern and western portion of that State became the largest employer of labor in the State, giving almost continuous employment to about 10,000 persons. Mr. Daly possessed extraordinary ability as an organizer. He had a very positive disposition and was aggressive and relentless in carrying out his plans.

HENRY VILLARD.

Henry Villard, the railroad magnate and financier, died at his summer residence, Harwood Park, near Dobbs Ferry, N. Y., November 12th.

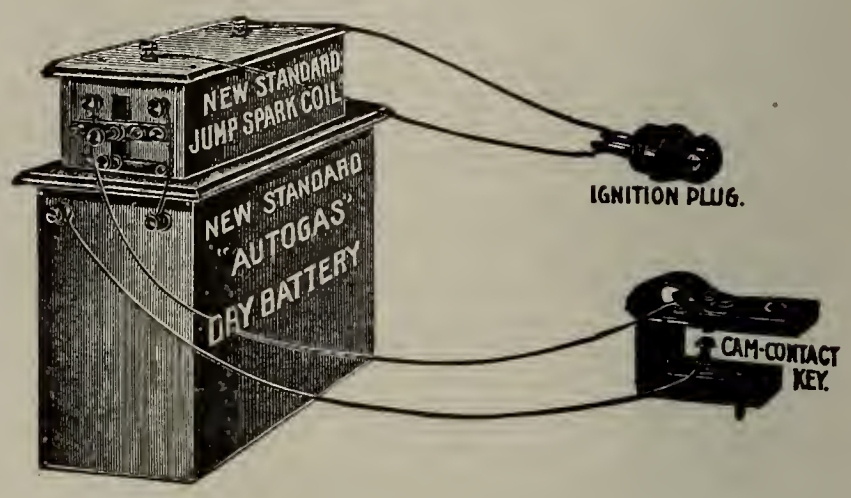
Mr. Villard, whose real name was Heinrich Hilgard, was born in Speyer, Bavaria, on April 11, 1735. He came to this country in 1853, and after an eventful career as a war correspondent, entered the railroad field, being the organizer of the Northern Pacific. Twice Mr. Villard's fortune was swept away but each time he arose, phoenix-like, to greater prominence than ever before.

He aided and encouraged Edison in the experiments which resulted in the incandescent light. In 1890 he purchased from Edison his electrical manufacturing interests and organized the Edison General Electric Company, of which he was president for two years.

THE NEW STANDARD GAS AND GASOLINE ENGINE IGNITION SYSTEM.

The following applications are claimed as new for this system: The perfect insulation of the wires necessary to the use of the electric current without grounding on any part of the engine frame, as per illustration. The reducing to a minimum the consumption of current. In other systems heretofore used the battery had to do all the work; in this system the secondary induction coil is made to do nearly all the work and besides there is no leakage of battery current. By this system batteries will last about twelve times longer than by any other method heretofore used. All that is necessary is that the wires from the secondary posts of coil to sparking plug are kept at least one inch apart and also an inch from the frame.

The Autogas battery, which is used in connection with the above system, is set up in a neat wooden box, containing eight cells, with first point connected on four cells. When they cease to be strong enough one or more can be tapped on until all are used up; this method in itself will lengthen the life or work of the cells 80 per cent. The ignition plug is cut for 1 inch standard pipe thread and can easily be made to fit any size hole in cylinder by reducing up or down to ½ inch. The cam-contact key is simple in construction and certain in operation. The cam on the shaft makes contact by pressing down on an insulator on the end of the key. It can positively be adjusted to spark when the piston



The New Standard Gas and Gasolene Engine Ignition System.

is at any particular position in the cylinder. The coil, which is made by one of the best known coil makers, can be made to work on two cells, if necessary.

The above system can be applied quickly to engines now equipped with butt or wipe spark without change of mechanical movements. It is manufactured by William Roche, 42 Vesey street, New York city, the well known dry battery manufacturer, who will be pleased to send further details and prices upon application.

Electricity in Germany.

SMALL ELECTRIC MOTORS IN GERMANY.

Consul-General Guenther reports from Frankfort: Contrary to American practice, which seldom uses anything smaller than motors of 5 horse-power for driving machine tools, says the Elektrotechniker, experience in Germany has shown that driving with small motors, despite their lower efficiency, may be more advantageous than driving with large ones. The ideal system of running is the separate motor system, by which each machine is run indepedently and light loads thereby avoided. But the introduction of this system depends to a great extent upon the initial cost of installation. Success has been obtained with alternate-current motors of 2 horse-power without commutator or brushes and without regulating resistance.

ELECTRICITY ON GERMAN FARMS.

Consul Hughes, of Coburg, says: In this and neighboring parts of Germany, considerable attention is being paid to electrical appliances that can be used on the farm. Near Ochsenfurt, in Bavaria, a company composed of landowners and small farmers has been organized for the establishment of an electrical system for use on their farms and in villages. The power is to be generated by steam and water and the current to be distributed from a central station to the places at which it is wanted. Substations are to be established at given points, with the necessary apparatus for connecting with the farm or other machinery and also for lighting purposes in the houses, offices, roads, and village streets.

PRODUCING GLOBULAR ELECTRICAL DISCHARGES.

A globular electric discharge is produced by S. Leduc, a French electrician, by arranging two fine polished metallic points at right angles to a photographic plate or glossy gelatino-bromide paper, and connecting them with an electrostatic machine. The effect is made more sure by placing a sheet of metal under the photographic plate or under a piece of glass holding the paper. On separating the points 2in. to 4in., an effluvium appears at the positive and a globule at the negative, the globule separating itself from the point on reaching a certain size and traveling slowly by a more or less irregular path to the positive point. The time taken in the passage is one to four minntes. As the positive is reached, the light and the charges disappear as if a conductor had connected the machine's terminals, but the pheonomena are repeated when the positive is moved to a fresh place.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED NOVEMBER 6, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of five cents.

661,107. Carbon pencil or electrode for electric lights. John F. Sanders, Chicago.

661,125 and 661,126. Electric-arc lamp. John Heany, Philadelphia.

661,165. Protecting underground metallic structures from effects of electrolysis. Lucien Blake, Lawrence, Kans.

661,173. Electric call or signal box. Glenn and Sullivan, Philadelphia.

661,195. Automatic magnetic circuit-breaker. Wm. Scott, Philadelphia.

661,196. Rheostat and circuit-breaker. Wm. Scott, Philadelphia.

661,227. Commutator-collector. Henry Reist and Edward Aiken, Schenectady, N. Y.

661,227. Brush holder. H. Reist, Schenectady, N. Y.

661,241. Fuse. Otto Feuerlein, Charlottenburg, Germany.

661,244. Electric cable. Wm. Habirshaw, N. Y.

661,260. Transmitter. Richard Ferguson, Baltimore.

661,292. Dynamo. John Kelly, Pittsfield, Mass.

661,306. Dynamo. Cummings Chesney, Pittsfield, Mass.

661,458. Electric R. R. H. Schraunn, Nurenberg, Germany.

Business News.

NEW INCORPORATIONS.

Oelwin, Iowa.—Outside capital has incorporated the Oelwin Light, Heat and Power Company for $100,000.

Albany, N. Y.—The Whitehall Gas and Electric Company has been incorporated by New York and Whitehall capital for $50,000.

Ithaca, N. Y.—The Ithaca Electric Company has been incorporated for $50,000. The company will generate electricity for light, heat and power.

Dover, Del.—A $25,000 corporation, known as the White Motor and Machine Company, of Waltham, Mass., was recently chartered at Dover.

Mount Vernon, Ill.—Papers have been filed for the Mount Vernon Electric Light Company's certified increase in capital stock of $5,000, thus bringing the figures up to $25,000.

Little Rock, Ark.—Incorporation articles were recently filed by the American District Telegraph Company, of Arkansas, in Little Rock. The company is capitalized at $10,000.

Jackson, Miss.—The charter has been applied for by the Southern Electric Light & Power Company, of Vicksburg, which will be capitalized at $100,000. The company will build, control and operate electric, gas and power plants throughout the south and it is stated that a Chicago capitalist, Mr. J. C. Schaefer, is at the head of the movement.

TELEPHONE CALLS.

Lancaster, Ohio.—The Lancaster Telephone Company has recently been incorporated for $100,000.

Amherst, Ohio.—The Amherst Home Telephone Company has been chartered by local capital for $25,000.

Hanabora, Miss.—A telephone system about eight miles long will be constructed by private individuals in the near future.

Des Moines, Ia.—The Audubon County Telephone Company has been incorporated for $25,000 by local capitalists.

Paris, Ky.—The Paris Telephone Company's system has been purchased for $9,000 by the Columbian Telephone Company, of Nashville, Tenn.

Mauch Chunk, Pa.—A recent incorporation is the Carbon County Telephone and Telegraph Company, which has been chartered with a capital stock of $30,000.

Sioux Rapids, Iowa.—The Sioux Rapids Telephone Company, which has been doing a general telephone business, has been incorporated with $10,000 capital stock by promoters of that city.

Brenham, Tex.—An increase of $5,000 to its capital stock has been voted by the directors and stockholders of the Texas Telephone Company. This increase brings the capital up to $10,000.

Delevan, Wis.—Incorporation articles have been filed for the State Long-Distance Telephone Company, whose capital is $25,000 and whose main office will be located in Delevan.

Independence, Iowa.—Among the incorporations of recent date is that of the Buchanan County Telephone Company, which has been chartered with a capital stock of $50,000.

ELECTRIC RAILWAYS.

Shamokin, Pa.—Incorporation articles have been granted to the New Castle & Sharon Street Railway Company, which is capitalized at $150,000.

Buffalo, N. Y.—Among recent incorporations at Dover, Del., is that of the International Rapid Transit Company, which has been capitalized at $1,100,000 by Buffalo promoters.

Albany, N. Y.—Capitalists of Albany have incorporated the Albany County Railway Company, with a capital stock of $20,000, to build an electric line three-quarters of a mile long on Central avenue in that city.

New Castle, Pa.—Philadelphia financiers, headed by W. R. Wright, have incorporated the New Castle & Sharon Street Railway Company for $150,040. The road will be 20 miles in length and run between the towns of New Castle and Sharon.

Boston, Mass.—Capitalists who are said to be interested in the Lynn & Boston Road have incorporated the

Middletown-Danvers Strect Railway Company, which will run two miles to Danvers, connecting there with the Lynn & Boston system. The capital stock is $32,000.

Boston, Mass.—The Haverhill & Andover Street Railway Company has been chartered for $80,000 and will run from the Ward Hill Station, in Haverhill, to Andover, connecting with the Lawrence & Reading Line. At that point the road will be seven and one-half miles in length.

Hicksville, Ohio.—The Indian & Ohio Traction Company has secured articles of incorporation and certificates permitting it to operate in the State of Ohio. It is capitalized for $750,000 and will begin construction work on the Ohio end of its lines.

Harrisburg. Pa.—The Turtle Creek & Millstown Street Railway Company has been granted articles of incorporation with a capital stock of $6,000. An electric light and power plant, which will cost about $100,000, will be erected at Harrisburg and the line itself will extend from Lorimer and Osborne streets, Turtle Creek, to the village line.

Worcester, Mass.—A local paper states that the following changes have been made in the directors of the Worcester & Webster Strect Railway Company. H. F. Leland, E. E. Carpenter and Dr. Julius Garst have retired from the board, and in their places have been elected H. E. Back and E. D. Robins, of Danielson, Conn., who are also directors of the Webster & Dudley Street Railway Company, and Dr. E. A. Reeve, of the Worcester Polytechnic Institute. The list of new officers is as follows: President, Edgar S. Hill, of Webster; vice-president, Fred Thayer, of Pawtucket, R. I.; treasurer, W. A. Bailey; auditor, Edmund L. Parker; directors: these officers and S. A. Reeve, L. D. Robins and H. E. Back. The purpose of electing the Webster & Dudley men directors is to promotc more intimate and harmonious relations between the two companies.

NEW INSTALLATIONS.

Ilion, N. Y.—The city has recently issued $30,000 worth of bonds for the erection of an electric light plant.

Gaffney, S. C.—The city council has recently voted an additional bond issue of $15,000 for increasing the city's electric light and water facilities.

Middletown, N. Y.—A municipal electric light plant is being discussed by the citizens who have voted $10,000 in bonds for that purpose.

San Diego, Cal.—A complete duplicate plant has been decided upon by the San Diego Gas and Electric Light Company at a cost of $25,000 and a capacity of 380 arc lights.

Laurel, La.—A franchise has been granted to private enterprise for the construction and operation of an electric light and power plant, the primary object being the lighting of the town.

Ruston, La.—A bond issue of $25,000 has been made for erecting an electric lighting and waterworks plant in that city. Mr. R. M. Adams is the engineer in charge.

Athol, Mass.—A purchase of land and water rights has been made on the banks of Miller's River by the Athol Street Railway Company, which will erect an electric lighting plant there, costing in the neighborhood of $6,000.

Washington, D. C.—Plans have been completed in the Indian Office for an electric light plant and its equipment for the Chilocco Indian School, near Arkansas City, Ark., and tenders for the construction work will soon be advertised.

Delray, Mich.—A franchise has been asked for by local parties for the erection and operation of an electric light plant with the conditional clause that the plant may be sold to the authorities at any time within six years after April 1, 1901.

AUTOMOBILES.

Minneapolis, Minn.—The Blood-Mille Motor Vehicle Company, of Minneapolis, has been capitalized for $500,000 in 5,000 $100 shares, by local promoters.

New Albany, Ind.—Local capitalists have incorporated the Automobile Cab Company, of New Albany, for $35,000 capital stock.

St. Louis, Mo.—A recent incorporation under Missouri laws is the Scott Automobile Company, of St. Louis, which has been chartered for $30,000.

Philadelphia, Pa.—It is stated that the Lewis Motor Vehicle Company is about to decrease its capital stock from $10,000,000 to $90,000. This will be done to avoid payment of the annual corporation taxes, which, in this instance, would amount to about $4,000 a year. Some time ago the same company distributed its assets among the stockholders as the best way to escape from the difficulty.

CORPORATION CHANGES.

Philadelphia, Pa.—The Woodbury & Southbury Electric Company, of Connecticut, has been purchased for $200,000 by the United Gas Improvement Company, of Philadelphia. The length of the road is six miles.

Albany, N. Y.—The New York & Queens Electric Light and Power Company has filed a certificate with the State Department stating that its directors have been increased from three to seven, among whom are Harrison E. Gentry, George F. Baker and J. Levering Jones.

Medina, N. Y.—A temporary receiver has been appointed by the Supreme Court for the Medina Gas and Electric Lighting Company, by application of the attorney general in proceedings to dissolve the corporation. Business has been suspended for over a year, and it is alleged that the company is insolvent.

NEW YORK NOTES.

H. B. COHO, GEO. H. WATSON AND JAY HOLMES have formed a stock company and are prepared to figure on and install steam and electric plants. They will give particular attention to factory and mill work, and will handle both direct and alternating current machinery. The name of the company is H. B. Coho & Company, Incorporated; address, 149 Broadway. Mr. Coho is the president; Mr. Watson, vice-president, and Mr. Holmes, treasurer.

WESTON STANDARD ILLUMINATED DIAL



STATION INSTRUMENTS.

THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co., Ritterstrasse No, 89.
LONDON. Elliott Brothers, No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 21. NEW YORK, NOVEMBER 24, 1900. Whole No. 706.

Gas Engine Ignition.

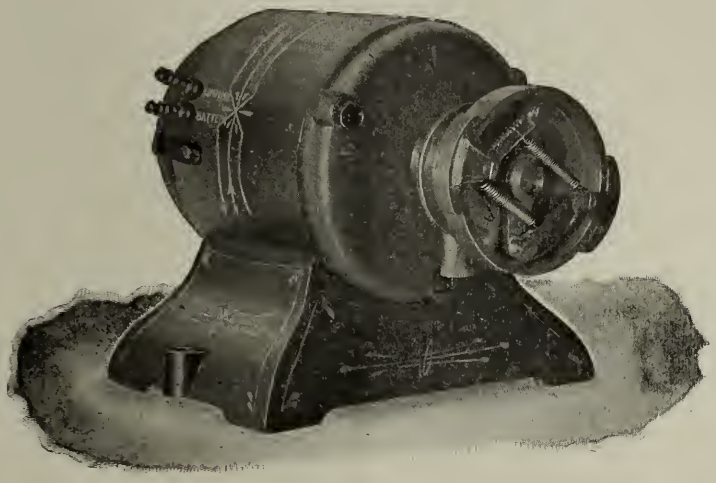


Fig. 1.—Igniting Dynamo with Door Open.

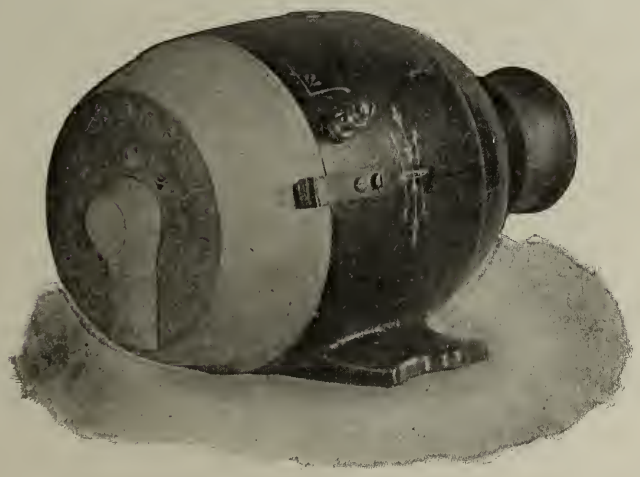


Fig. 2—Type "E" Igniting Dynamo.

IGNITING APPARATUS FOR HYDROCARBON ENGINES AND AUTOMOBILES.

The Apple gas engine igniters have been on the market for over four years, and in this time thousands have been sold and are being used daily on gas engines throughout the country. A large per cent. of these igniters are used with stationary engines. But since bringing out the entirely enclosed dynamo (as illustrated herewith) the sales for portable work have been phenomenal, and the manufacturer, the Dayton Electric Manufacturing Company, Dayton, Ohio, now has a factory with 12,000 sq. ft. floor space with modern machinery capable of turning out from 75 to 100 igniters of different types per day. The type "E" enclosed dynamo is now used with all types of outfits requiring dynamos. It is entirely enclosed, making it dirt and waterproof, and while being entirely enclosed, means are provided for easy access to its working parts. It is well insulated, there being no danger of short-circuit or ground, the mechanical work is the best and it is finished in black japan, all the brass parts being polished.

Fig. 1 shows the type "E" igniting dynamo with door open. The weight of this machine is 20 pounds, and it will operate either touch or jump spark coils as desired. Fig. 2 shows the type "E" igniting dynamo, which is the same as above, with the exception that it has a base which contains a good spark coil entirely sealed with paraffine, thus making it moisture and waterproof.

It is also fitted with a governor pulley which will maintain the speed of the igniter constant, no matter what is the speed of the engine; and where desired, en-

gines can be started without a starting cabinet. The governor pulley operates the same as an engine governor, releasing the friction shoes when the speed is right; it is simple, and provision is made for easy adjustment. This governor is also furnished with the type "E" dynamo without base when desired. The weight of the type "E" with base and coil is 32 pounds.

Fig. 3 represents the starting cabinet, which is a two-cell storage battery made in such a manner that there are no rubber jars or wood box required, thus saving space and danger from breakage. It is entirely sealed, and weighs only 20 pounds, and occupies a space of 10 ins. long, 1½ ins. thick and 8 ins. high. One of the principal advantages of this cabinet is that there is not a joint in the entire battery, thus reducing absolutely the danger of poor connections, as is often the case with storage batteries in such service. Where it is not objectionable to carry the little extra weight, the company recommends the use of its starting cabinet rather than dependence on the dynamo alone, as it is a source of reserve power which will spark the engine in case of accident to the dynamo and saves the trouble of turning the engine so often in starting. It provides means besides for testing electrodes in cases where the engine fails to start and enables the operator to easily determine if fault is with the spark mechanism.

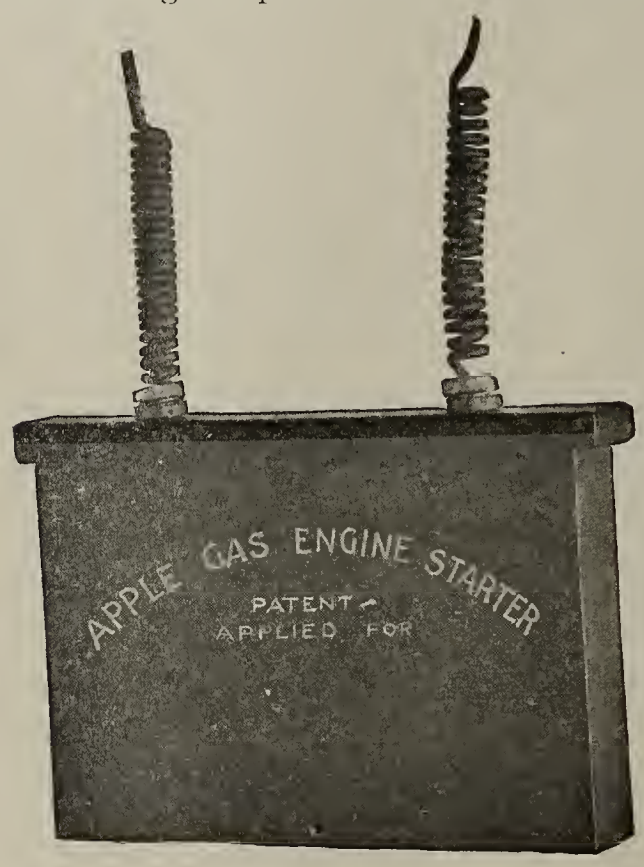


FIG. 3.—Starting Cabinet.

THE ELECTRO-MAGNETIC PHONOGRAPH.

One of the most remarkable inventions of the age will reach this country within a short time. It is an electro-magnetic phonograph, the invention of a Swede, the patent rights for which have been sold in France for one million and a quarter francs. The phonograph proper dispenses with the wax cylinder in its entirety. A steel cylinder is employed or at least a cylinder wound with steel wire. The speaking device is practically a receiver, the minute magnetic changes of which affect the steel cylinder on the same principle that a steel plate might be written on with a magnet and the writing shown by a sheet of paper spread over the plate and iron filings sifted on it. This steel cylinder in the same manner receives the delicate and almost infinitessimal changes occurring in the receiver, without contact between the cylinder and the receiving or transmitting device being at all necessary.

Drawbacks of Artificial Light.

THE WASTEFULNESS OF PRESENT MEANS OF ILLUMINATION.

Perhaps one of the oldest of all practical applications of physics has been that concerned with the production of artificial light, and it is strange that, although the problem has been worked at for so many years, it has even now, at the end of the enlightened nineteenth century, received a very unsatisfactory solution. When we compare, say, the great increase in efficiency of the steam engine and dynamo of the present day over that obtained twenty years ago with the increase in efficiency of our sources of artificial light, we are bound to admit that a very small advance has been made. This unsatisfactory state of affairs is due largely to the fact that the true nature of the phenomenon of light has been demonstrated by physical science only within very recent years, and a thorough knowledge of the nature of any phenomena to be reproduced must in all cases precede any satisfactory and efficient production of them.

Under the best conditions obtaining at present, out of every 100 tons of coal delivered at gas works or electric light stations, something like 98 tons are, as far as the production of light is concerned, absolutely wasted, and go to produce useless heat. When one considers the enormous quantity of coal used annually for the production of artificial illumination, the absolute waste of 98 per cent. of it seems little short of criminal.

Will the problem ever be solved? It must be confessed that at present the prospects are far from being bright. Some means must be found of exciting ether vibrations between the visible limits only, and of eliminating the slow, radiant heat waves. Whatever method may be eventually employed, it is interesting to note that already, on a small scale, the problem has been solved by the firefly, the most delicate measurements having failed to detect any radiant heat in the light emitted by this little creature. Surely this ought to be an interesting subject for investigation by the physiological chemist, who, working in conjunction with the physicist, might enable us to get nearer the solution of this important question.—Dr John Henderson, in Cassier's Magazine.

New Publications.

"THE MODEL ENGINEER AND AMATEUR ELECTRICIAN."

We have received a copy of the above journal, which is edited by Percival Marshall, A. I. M. E., and published in London, England. It contains articles by experienced writers on the construction and working of model steam, gas and oil engines; model locomotives and railways; model boilers; model steam and electric launches, and sailing yachts; brass and iron founding; forging; model dynamos and motors; electric bells, telephones and batteries; accumulators; electric lighting; influence machines; electrical experiments, etc. Also "Model Engineers and Their Work," "Our Beginners' Column," "Practical Letters from Our Readers," "Amateurs' Supplies," "A System of Queries and Replies," "Original Working Drawings," "Prize Competition" and "Model Yachting Notes." This little journal, the subscription price of which is $1.50 per annum, ought to fill a long felt want among the younger generation with a hankering towards mechanics and the allied arts and sciences and we can highly recommend it for that purpose.

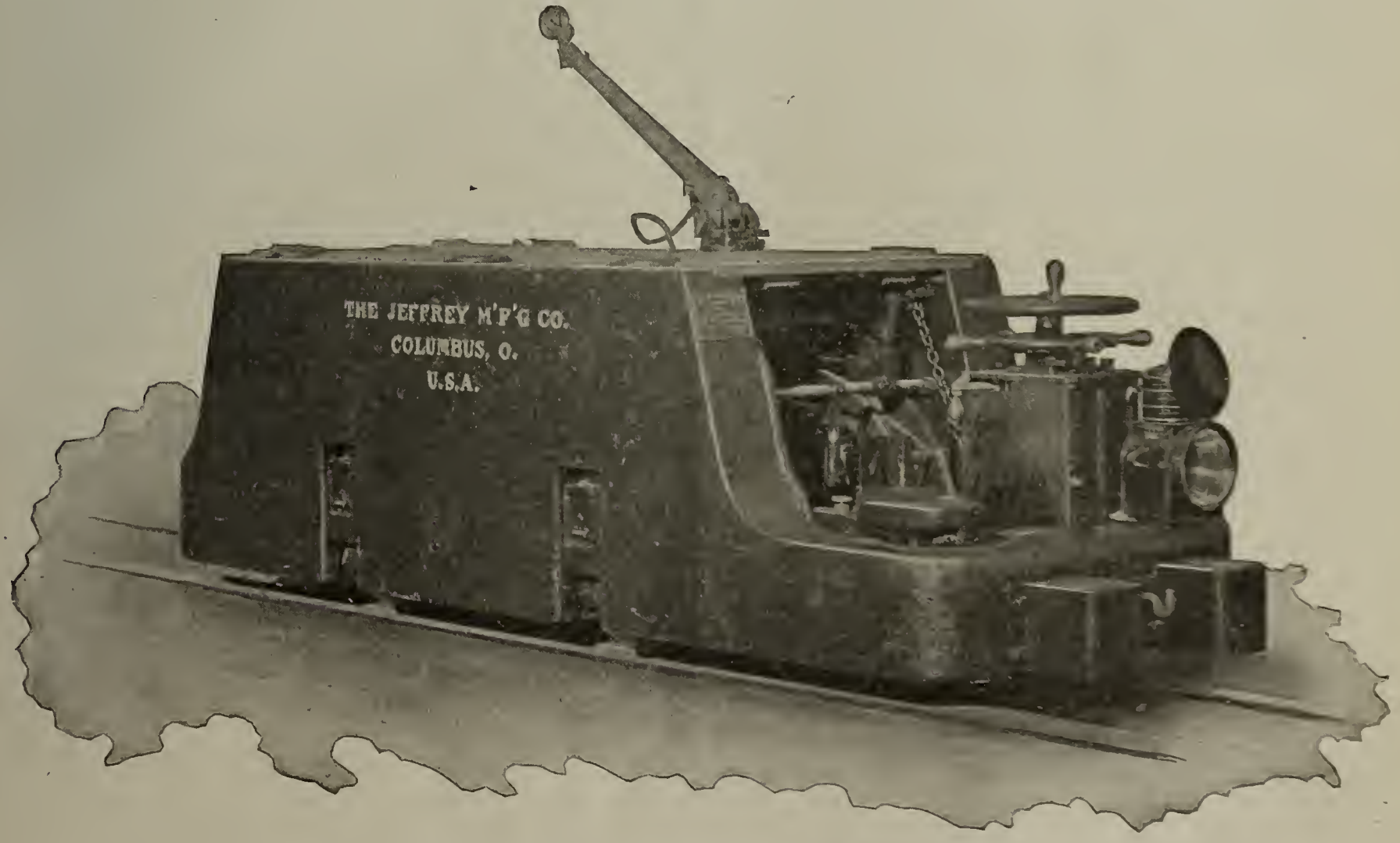
Miscellaneous Applications of Electricity.

THE ELECTRIC MOTOR IN MINING.

The motor in mining plays an important part in the Far West as well as the coal mines of Pennsylvania. Hoists, elevators, mule trains, drills, etc., are now operated by electricity and in the illustrations are shown machinery of this character. In the Alta Argent Mine, of Aspen, Colorado, the electric hoist is shown as operated. This mine is very deep and the necessity for a safe as well as economical motive power had arisen for several years. Not only are the disadvantages in the use of steam appliances due to the inconvenience experienced in erecting the machines but likewise the heat is a factor as well. By the use of electricity for hoisting,



Electric Hoisting Machinery in the Alta Argent, Aspen, Colorado, Mine.

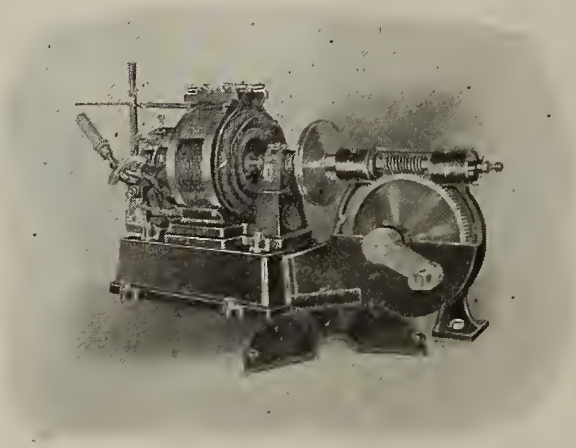


Electric Coal Cutter Installed in a Pennsylvania Mine.

to take the place of the mule, for drilling and ventilating, better work is performed by the miners in less time and the gains are greatly in evidence at the end of the year.

THE ELECTRIC ORGAN BOY.

The organist no longer depends upon the organ boy during religious functions; the organ is pumped by electricity and the air reservoirs kept supplied without sacrilige being committed on a day of rest. The organ boy has disappeared and soon, like the ancient chimney-sweep, will be only a recollection. The motor attached to the pumping device is stored in the organ loft and

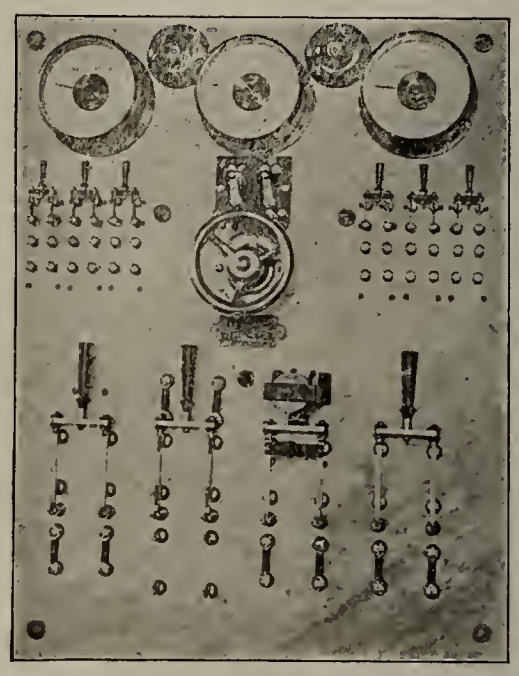


Electric Motor Direct-Connected to Organ Pump.

the organist, by merely touching a button, sets in operation the apparatus at his command. It is noiseless and efficient and has become a fixed institution in the more important places of worship of all creeds in America's largest cities.

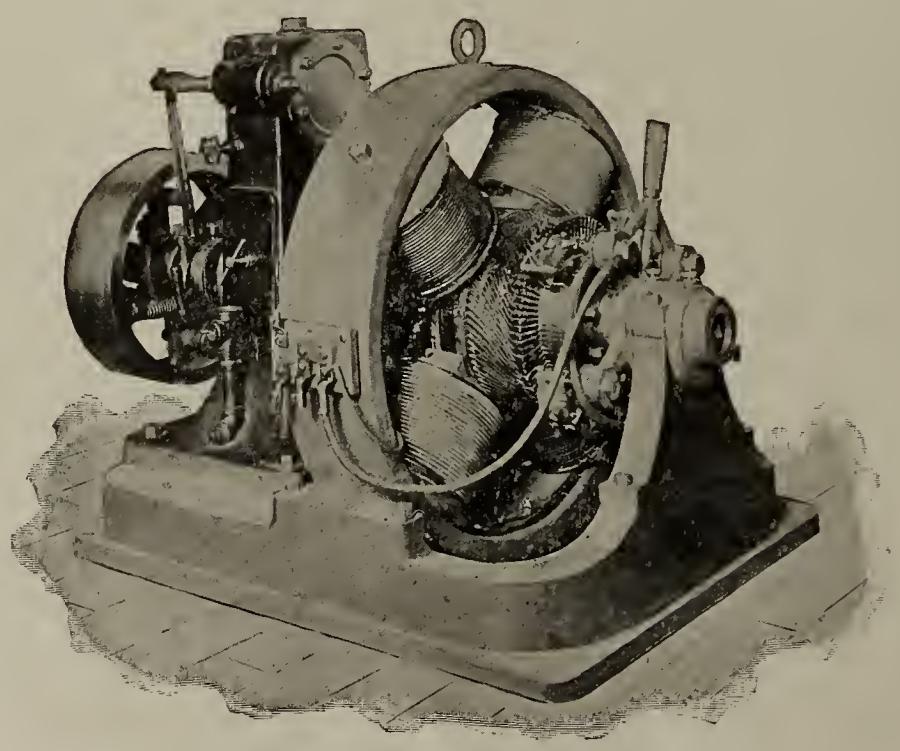
ELECTRIC LIGHT AT HOME.

The New Britain Machine Company, of New Britain, Conn., have placed upon the market, in conjunction with a compact engine, an electric light plant of the smallest possible dimensions consistent with practical purposes. An installation of this kind, as shown, is light in weight, self contained, durable and efficient. The plant and switchboard can be handled by one man, whose hardest work would be merely that of keeping the steam pressure up. In many private clubs and homes a small plant of this kind, in charge of an engineer, will supply all the comforts that an advanced civilization is able to afford in the way of hygienic lighting, good ventilation and, in the summer, cooling breezes through the medium of fan motors. Suburban residents will find an installation



Switchboard for Private Residence.

like this a great boon and a saving, if the home is of fairly large dimensions. These complete plants are sold all over the country and abroad with constant demands for more.



A Model Direct-Connected Electric Light Plant for Private Residence.

New York City.—The Lambert Schmidt Telephone Manufacturing Company, with headquarters at 93 Maple street, Weehawken, N. J., has been incorporated with a capital stock of $50,000.

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NEWTON HARRISON, E. E. Editor.

Walter Mueller, Managing Editor.

ASSOCIATE EDITORS.

Electric Light and Power.

Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.

Electro-Therapeutics.

Joseph Muir, M. D.
Frederick Strange Kolle, M. D.

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ELECTRICITY AS APPLIED TO SUBMARINE WORK.

The imagination of Jules Verne, with its wonderful suggestions of the applications of electricity to purposes new and strange, took into consideration but a small percentage of the scientific possibilities of the age. His submarine vessel, the "Nautilus," has found its duplicate in the famous Holland boat and the airship his mind's eye surveyed is now well crystallized in the work of Count Zeppelin. Altogether we must say that the vivid conceptions of this author have been outdone and the future holds many secrets which will yield marvelous machines to aid in the work of the new century.

In a general way electricity has been applied in diving and dredging for the last five years. No special attention has ever been called until lately to the special devices now employed to assist in work of this character. The most necessary requirement of the diver is light. In deep-sea diving the light diminishes very rapidly with the increase in depth; in fact, there is scarcely any doubt but that the most Stygian darkness exists less than a mile beneath the ocean's surface. Not only is light required by the diver but the light giving device must be well protected against the enormous pressure of the water.

Successful diving is limited to a distance of about two hundred feet below the surface. At this distance the pressure is enormous and the submarine arc lamp employed must be so constructed as to resist the pressure of the heated gases within as well as the enormous static pressure without. It is difficult to realize the crushing force with which water affects comparatively strong bodies beneath the surface. Instances are numerous of wounded cephalopods diving too deep in their agony and rising to sight in the last stages of dissolution: their death brought on not by the harpooner but by their suicidal descent and consequent destruction.

In the construction of submarine vessels and much that pertains to them electricity is a natural and necessary requisite. It is therefore necessary for those engaged in industrial applications bearing upon this field of effort to understand and appreciate the physical conditions to be combatted at great depths.

Some few of the industries to be mentioned which will take advantage of the opportunity offered by the sale of special lighting devices for deep-sea illumination are pearl fishing, sponge fishing and fishing for mother-of-pearl. Representatives of several large business houses of this character are now in the market for appropriate apparatus to enable them to conduct their business with greater convenience and on a larger scale. This curious industry, as ancient as Tubal Cain and as famous as Cleopatra, has not changed materially in any respect, yet through the application of electricity it is to be hoped that the work will be conducted with facility and safety by the natives engaged in it.

THE SMOKE NUISANCE.

In England a smoke abatement society has been formed with a first class organization for the purpose of preventing the nuisance. According to our contemporary, the London "Electrical Review," the president of the Smoke Abatement Society sent the London "Times" a statement to the effect that 18,000,000 tons of coal are annually consumed in London, of which more than sixty per cent. is wastefully dissipated, aggregating a cash loss of about $40,000,000. This remarkable statement is considered to be a very conservative one. In America, where more coal is burnt, the loss would probably run up to double this amount.

The difficulty presents itself in two forms: first, as a waste of heat; second, as the waste of fuel as smoke. The waste of heat cannot be entirely remedied as radiation and the natural draught in furnaces is bound to cause an irremedial loss of heat energy. On the other hand, the more perfect the combustive processes the more we approach the solution of the problem of preventing smoke. A crusade was recently begun in New York against the smoke nuisance and several large concerns, including the best known electric light institution in Greater New York, were enjoined from burning soft coal at the risk of a heavy fine.

The invention of a boiler whose furnace will absolutely consume the smoke would be a great boon to civilization. It is well known that in many cities of the United States men change their shirts twice a day. The deposits of soot are so extensive that particularly in the case of Pittsburgh a pall hangs over the city, representing the ejected particles of carbonaceous material issuing from hundreds of blast furnaces.

With reference to electric light plants employed for purposes of public benefit the smoke nuisance is not eradicated by the use of high chimneys. When coal is burned it must be entirely consumed or disagreeable result follow. Tests have been made for some time by the Manhattan Elevated Road, of New York city, to not only prevent the smoke nuisance but to entirely consume the coal to be burnt. Devices were employed by means of which coal in a finely powdered state was introduced into the furnace, a complete combustion being thus brought about. There is a possibility of such a changes in furnace construction of a more or less radical character.

THE RELATION BETWEEN CURRENT AND LINES OF FORCE.

The current flowing from B to A produces a species of molecular movement within the wire that generates heat. In addition, other phenomena present themselves, identified, in many respects, with the ether. Molecular action within the wire induces in the ether surrounding it what are called lines of force. These lines of force

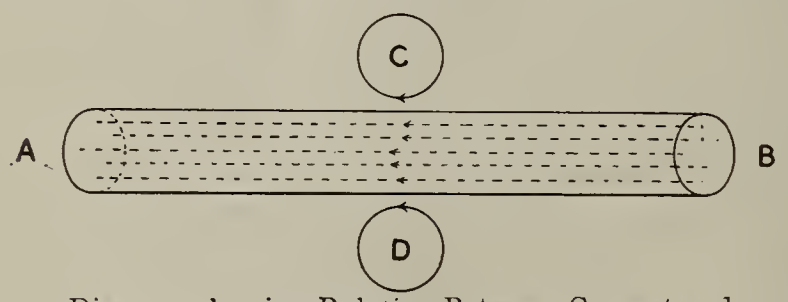


Diagram showing Relation Between Current and Lines of Force.

have a fixed direction of rotation, depending upon the flow of the current from either B to A or A to B. A set of magnetic curves can be obtained, showing the concentric rings of magnetic lines of force around the wire, by introducing the wire through a sheet of paper, using a heavy current and sprinkling filings around the wire. The current in the wire determines the direction of these lines of force. They in their turn determine the direction of the current when a coil of wire is moved in a variable magnetic field.

FURTHER TRIALS OF THE MARCONI SYSTEM.

The Herald publishes the following: Remarkably successful trials of Mr. Marconi's wireless telegraphy were recently witnessed by the Belgian government officials while the Princess Clementine was making a voyage from Ostend to Dover, but the crowning achievement of all was when a message was sent from the Princess Clementine to Mr. Marconi's wireless station at Dovercourt, Essex, a distance of eighty or ninety miles, including many miles of cliffs. Long messages were also sent from Dover Pier to Mr. Marconi's office in London, via Dovercourt and Chelmsford. The Belgian authorities are so satisfied with the results of the wireless system that it will shortly be put up on other vessels in the fleet. Both the Northern of France Railway Company and the English railway companies are anxious to have an installation on the Dover-Calais boats, but the objections of the English government prevent this being done at present.

ELECTRIC MOTORS FOR PRINTING PRESSES.

By W. H. Tapley.*

To properly determine the size of a motor for a press, the one thing to bear in mind is to have it large enough to start it, no matter in what position the press may be. This tends largely to reducing to a minimum the non-productive period. The motor should be wound to have its highest efficiency at about three-quarters full load, as experience has shown that the majority of presses operate at from 60 to 75 per cent. of the rated capacity of the motors best suited to their use.

The question as to whether the geared or the direct-connected motor should be adopted for printing press work is still a disputed question, both types having distinct advantages, but neither containing all. Compactness and noiselessness are the principal advantages of the direct-connected types. Their speed necessarily cannot be standard, but must conform to the press which they are originally intended to operate. The bore of armature and supporting brackets, or sub-base, must be special for each size and style of press. Their cost is generally twice that of a standard, moderate-speed, geared motor.

The disadvantage of the geared motor is principally that the ratio of gearing made necessary by the speeds of certain makes of presses is such that it is practically impossible to run without noise. This, with the difficulties of securing a substantial mechanical connection between the motor and the frame of the press, is more than offset by first cost, the fact that all motors of the same horse power are uniform throughout, permitting an interchange of parts, thus reducing delay, in case of injury to motor, for repairs to a very short period, while stoppage of press with a direct-connected motor might result in loss from idleness of press exceeding the entire cost of a standard geared equipment.

The geared motor has the further advantage that when disconnected from an old press it can be applied to a new one of the same size, but of different make, irrespective of size and speed of the press shaft, which might vary so much as to make it impossible to again use a direct-connected motor without entirely rewinding it at a cost greatly in excess of that caused by changes needed with a geared motor, namely, that of gearing to suit the new press. Most press builders will provide this in lieu of the countershaft furnished with old steam, belt-driven presses. The cost of current for doing work, all things being equal, on sizes from 5 H. P. to 10 H. P. is about on a par. With from 1-2 H. P. to 3 H. P. it is in favor of the geared motor.

BOSTON & ALBANY LEASED BY NEW YORK CENTRAL.

The Boston & Albany Railroad having been leased to the New York Central, the mileage of the Albany road will now be added to that of the New York Central, and hereafter a thousand mile ticket of the New York Central & Hudson River Railroad will be good on the Boston & Albany Railroad. This will prove a great convenience to the traveling public who desire to reach points in Massachusetts on or reached via the Boston & Albany, including, of course, Boston. The holder of a New York Central thousand mile ticket will now have the privilege of riding over lines aggregating more than 6,000 miles of railroad on a ticket costing only two cents per mile, good for the person presenting it and good until used.

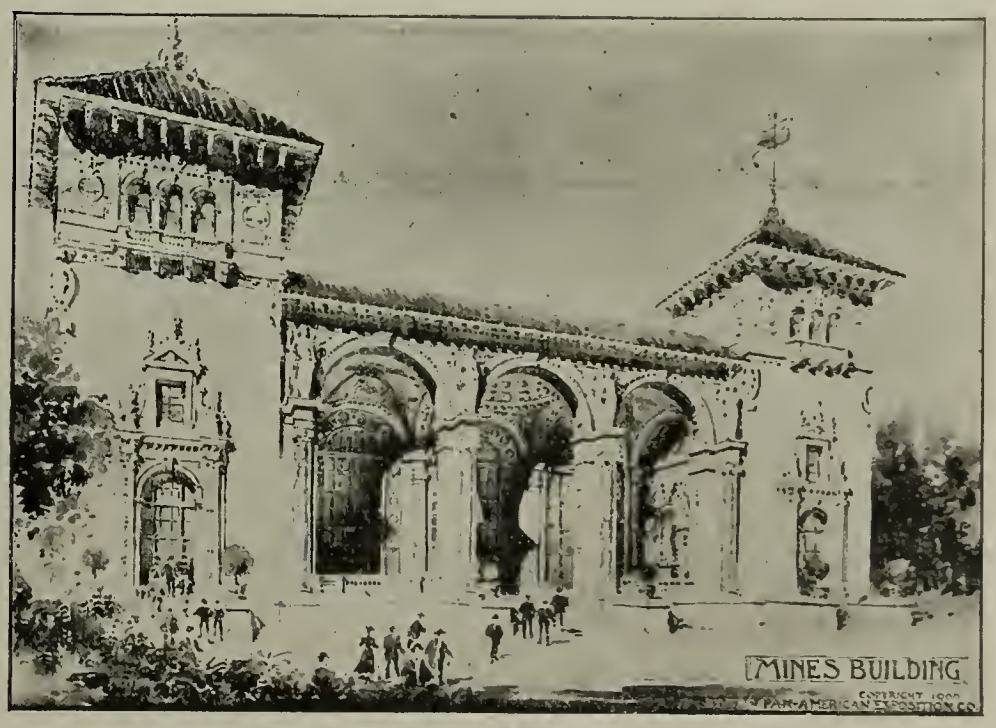
*In "Cassier's Magazine."

The Pan-American Exposition.

MINERALS AT BUFFALO.

EXHIBITS OF MINES AND METALLURGY AT THE PAN-AMERICAN EXPOSITION.

No feature of the Pan-American Exposition will be of more importance than the exhibit of mines and metallurgy. The building to be devoted to these exhibits is one of a group of three magnificent structures arranged in the form of a horseshoe, at the western boundary of the Esplanade. The Mines building is the southernmost of the group and is connected with the Horticultural building by one of the conservatories which flank the Horticultural building on the north and south. It is 150 feet square and at each of the four corners it has a square tower 90 feet high. The eastern facade, looking upon the Esplanade, shows three high recessed arches between the towers, forming an open loggia elaborately and beautifully ornamented with plastic detail and decorated in brilliant colors. From this loggia are the main entrances to the building. There are also entrances in the corner towers. The ornamental detail is very picturesque and interesting. The design is by Peabody & Stearns, of Boston.



Never was the science of metallurgy or skill in mining more highly developed than in the present day. The golden decorations of King Solomon's Temple are estimated to have cost $250,000,000. Ever since the account in the book of Genesis of finding gold along the river Pison, a stream which flows from the Garden of Eden, the seeking for and mining gold has been one of the most fascinating industries. The production of gold throughout the world during the present century has steadily increased. The production in the United States in 1899 amounted to $72,500,000 while that of the whole world is given at $315,000,000, thus giving the United States the first position in production of gold of any country. In the matter of copper the United States produces 223,000 tons annually, or more than one-half of the world's output. The United States and Mexico are the two greatest silver producing countries. In other mining productions, the commercial value of which is considerably greater than that of the precious metals, the countries of Pan-America also lead the world. During the last year the coal output of the United States reached the enormous amount of 225,000,000 tons. This, as compared with Great Britain's output of about 200,000,000 tons and Germany's 100,000,000 tons, makes the question of the future production of coal, considering the rapid increase in America and the fact that European production has reached its limit and is already declining, especially noteworthy at this time. The Canadian output of coal and iron is an item of great importance. The near proximity of iron and coking coal and the proper fluxes gives Canada a great advantage in the manufacture of iron and steel. The advancement of these industries in North America during the past decade are phenomenal, the total production of the United States last year amounting in value to $413,758,414 and of non-metallic substances to a total of $601,872,631.

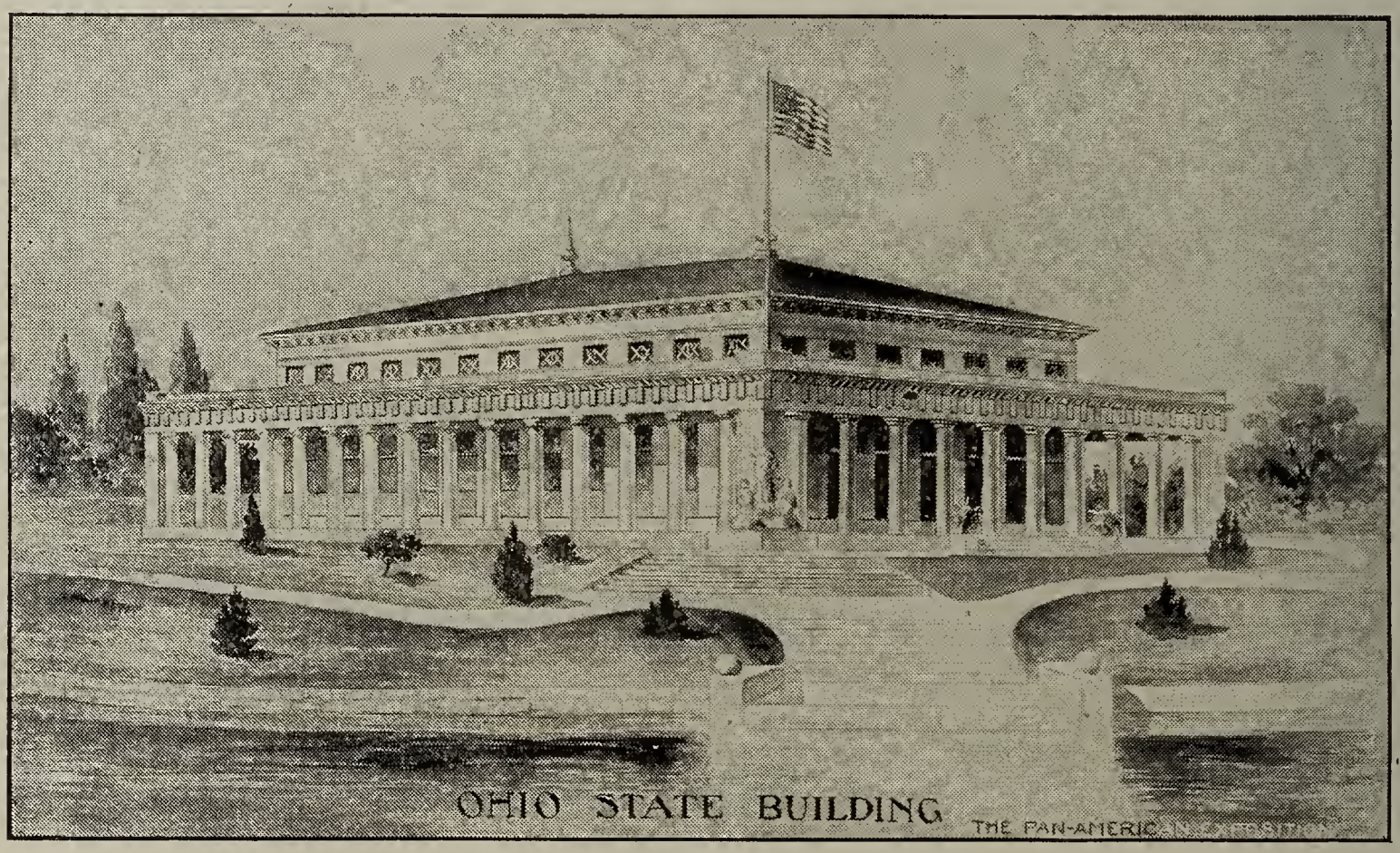
Besides the ordinary mining industries there are many others with which the general public is but little acquainted. Southern California has immense deposits of Asphaltum which are merely waiting the necessary capital and transportation for their development. California is also producing tin ore containing from 3 to 6 per cent. of metal. The value of this may be estimated from a contrast with the Tasmania mines which assay about 2 per cent. A great many productions such as diamonds, amethysts and other precious stones; mica, asbestos, zinc, aluminum, peat and salt belong also in this classification. The prosperity of nearly all the countries of the western world is largely due to their mineral wealth. Much of the manufacturing depends for success upon these productions and the ease with which they are obtained is what gives these western States and nations the advantage over older countries in this respect. The exhibit of Mines and Metallurgy at the Pan-American Exposition will illustrate graphically these advantages and will add greatly to the general knowledge upon the subject.

THE OHIO STATE BUILDING.

The plans for the building as designed by John Eisenmann, of Cleveland, have been approved by Governor Nash and State Auditor Guilbert. The size of the building will be 84 by 122 feet. A ten foot terrace walk will extend around the outside, being widened at the northwest corner to a circular form, thus provideding an

ample approach from the dock landing. The first floor will contain an assembly room, 30 by 53 feet, with a ceiling 24 feet high. This floor will also have a commissioners' reception room, ladies' reception room and private offices with a parcel room and post office. The second floor will contain a sitting room 23 feet square, with extra rooms for attendants and four guest chambers for the accommodation of State visitors.

The lower floor is intended for the use of the general public and the upper floor for the commissioners, State officials and the State guests. Natural gas will be used for heating and electricity for illuminating purposes. The artistic manner of lighting will constitute part of the interior decorations. On each face of the four corner pilasters of the porch, the State monogram will be interwoven with a wreath of buckeye leaves and fruit, the design containing a lighted torch. As the approach from the dock landing will be the most picturesque, the building will be embelished at the northwest corner with a statuary group. The background worked in relief upon the pilaster shows the great seal of the State with its hills, trees, sunrise and sheaves of wheat and arrows. In the foreground is the centre figure standing on the prow of a boat to typify the State. The Ohio river is represented by a Mermaid and Lake Erie by a Triton.


OHIO STATE BUILDING

THE PAN-AMERICAN EXPOSITION

❧ ❧ ❧

THE BEAUTIFUL BUILDING FOR FRUITS, OTHER PRODUCTS AND THE PLANS FOR OUT-DOOR EXHIBITS.

❧

Horticultural exhibits at Buffalo will have a beautiful setting in and about an exceedingly handsome building. Situated in a position of great prominence on the western side of the grounds, the approach from the east is through the esplanade, past the basins of aquatic plants, the fountains and the great urns containing beautiful tropical foliage effects; up the curved incline which is bordered by many odd varieties of fruiting trees and shrubs, to the magnificent doorway which is the subject of the accompaning illustration.

The Horticultural Building is connected by semicircular conservatories with the Graphic Arts Building to the north and the Mining Building to the south. These conservatories are themselves very beautiful architectural features of the Exposition and the fine floral displays in them will enhance their attractions to visitors. They connect the three buildings in this group but are distinct and separate buildings, having their own individual style and their exhibits of entirely different character. The court upon which the three buildings of the group face contains one of the superb Esplanade fountains.

Fruits of all kinds will be placed on exhibition during the summer. Much of the fruit will be preserved in cold storage, though the exhibit will change as the season advances and the different varieties ripen. A number of States have made arrangements to provide collective exhibits that will properly represent the horticultural products of their particular section. California is arranging for a special exhibit of the wonderfully diversified fruit production of that State. Other States are taking the matter up with the prospect of making the horticultural exhibit the most complete ever attempted.

Large as the Horticulture Building is, it will not contain all the horticultural exhibts. A plot of ground has been provided extending across the west front of the building on the opposite side of the grand canal, and extending south as far as the Elmwood gate. This plot has been under course of preparation for many months and will present a restful attraction in pastoral contrast to the hum of busy, energetic action which will be so characteristic of other portions of the Exposition.

Among the Societies.

NEW YORK ELECTRICAL SOCIETY.

The New York Electrical Society held its first regular meeting of the season at the College of the City of New York, on Tuesday, Oct. 30th, when, in spite of the inclemency of the weather, a good attendance assembled to listen to various addresses on the electrical features of the Paris Exposition and the work of the Electrical Congress. Mr. Carl Hering, president of the American Institute of Electrical Engineers, was the first speaker, and delivered an admirable address on the lighting features and novelties of the great show, making many cogent witticisms in passing on the features of merit or difference in connection with the leading European and American exhibits. His remarks were followed by the exhibition of some very interesting and handsome lantern slides covering not only the technical features, but some of the more artistic and spectacular portions of the exhibition. He was followed by Dr. A. E. Kennelly, who addressed his remarks more particularly to the modern steam turbine, as illustrated by "Turbinia," which was exhibited on the Seine, within the Exposition enclosure. He also took up and described in detail the mechanism of the moving sidewalk, his remarks being again accompanied by lantern slides. He took a very hopeful view of the future of the steam turbine, both ashore and afloat. The third speaker was Mr. C. C. Mailloux, who gave a most entertaining description of the whole work of the Electrical Congress and of the manner in which the American delegates succeeded in carrying through their programme with regard to the new units which were adopted or rather approved officially. Mr. Mailloux's references to the manner in which the members of the society had taken an active part in this work elicited very hearty applause. At the close of the meeting, as some little recognition of the courtesy of Messrs. Hering and Kennelly in coming before the society and entertaining its members so instructively, they were elected honorary members by a hearty and unanimous vote of thanks. Following up the admirable work done during the two years of administration by President Dunn, the society has started out on its present season with renewed hope and vigor, and the secretary was able to present a list of twenty-five candidates for membership, who were duly elected. Names are given below. It was also announced that during the present month Mr. Steinmetz will deliver a lecture before the society on "Alternating Current Work," and that in December Dr. Sheldon will deliver an address on "Electrical Measurements of Precision.



The following were elected to membership: Geo. W. Kuchler, Chas. O. Gunther, M. E.; Jas. L. Bunton, Rumsey W. Scott, B. A. Byrns, Fredk. A. Scheffler, C. E. Corrigan, Arthur Stanley Riggs, Chas. Gebhard, Joseph Vogelmann, Felix J. Bush, Wm. E. Harra, H. A. Eddleman, W. W. Todenworth, Jas. F. Gillespie, A. S. Clift, Peter Bay, H. McL. Harding, Clarence L. Healy, William F. Hunt, F. A. Stratton, A. B. See, Chas. Hodge, Hugh W. W. Wilson, Chas. Robbins, H. B. Proal, E. L. C. Hegeman.

Honorary members: Dr. A. E. Kennelly and Carl Hering.

The following committees have been appointed for the ensuing season: Finance—Arthur Williams, chair-

man; C. C. Baker, Jr. Papers and Meetings—W. C. Burton, chairman; S. L. Coles. Membership—F. V. Henshaw, chairman; S. L. Coles. Constitution and By-Laws—Arthur Williams, chairman; H. A. Sinclair, G. H. Guy.

STEINMETZ BEFORE THE NEW YORK ELECTRICAL SOCIETY.

The New York Electrical Society held its 209th meeting at the College of the City of New York on November 16th, when, before a very large and most appreciative audience, Mr. C. P. Steinmetz delivered a lecture on "Alternating Current Engineering." It may be said at once that no more valuable or interesting lecture has ever been delivered before the society. In the course of about an hour and a half, supplemented by replies to suggestions, Mr. Steinmetz treated of the development of the alternating current for power and lighting purposes; its application for long-distance work; its relation to continuous current local supply; questions of railway work; frequency, voltage, regulation, etc. While treating the subject broadly, Mr. Steinmetz presented a number of new facts and cleared up many obscurities in regard to the nature and use of alternating currents. At the close of the lecture and of the discussion, in which Messrs. Dunn, Henshaw, Burnett and Williams participated, Mr. Steinmetz, in response to a unanimous request, promised to put the lecture into written form so that it may be published by the society.

The Automobile.

THE ROBINSON GASOLINE AUTOMOBILE.

This automobile, which attracted considerable attention at the Show, is built by the John T. Robinson Company, Hyde Park, Mass. The specifications of the same are as follows:

Engine.—Two cylinders, each 4 in. by 6 in. stroke. Self lubricating. Water cooled. Thermo-circulation. Extra large bearings. Oil-tight aluminum crank case. Single balance wheel. Electric ignition by magneto. All part easy of access and readily adjusted. Speed at will from 150 to 1,000 revolutions per minute.

Fuel.—Eight gallons of gasoline are carried and five gallons of cooling water, which is sufficient quantity for 100 miles on ordinary roads.

Transmission Gear.—This is the well known Upton gear. Absolutely dust proof. Lubricated thoroughly in every part by one grease cup, with capacity of 100 miles. For all ordinary road work no gears are used. Engine drives directly on rear axle through a Baldwin nickel steel chain. Gear gives two speeds forward and a reverse. These, with the variable speed of the engine cover all necessary changes of speed from 0 to 25 miles an hour.

Steering—Is performed by large aluminum hand wheel, with mahogany rim, which is conveniently situated. The action is positive and the front wheels are locked in any position of the steering wheel. Shocks caused by obstructions in the road connot be communicated to the driver, thus removing all danger of a sudden change of direction when running at a fast speed.

Body.—The work on this is of the best and special attention has been paid in the design to provide plenty of room for the passengers. The seats are upholstered in dark leather and are 42 inches wide. The body is hung entirely separate from the engine truck on the best Palmer springs, thus ensuring very easy riding. Two styles of bodies are furnished: Stanhope, with Victoria top, and open Stanhope with spindle seat. Three Dietz automobile lamps are attached to the dasher. Patent-leather mud guards are fitted, and ample space is provided for carrying wraps, robes, etc.

Wheels.—Best Eames hickory wheels of the Savin type; 32 in. front and 36 in. rear; 3 and 4 inch Hartford pneumatic tires are used on front and rear wheels respectively. Driving is accomplished by the rear, and steering by the front wheels. Roller bearings are used throughout.

Capacity.—Two passengers, including driver.

Frame.—Channel steel, forming support for engine, gasoline tank and transmission.

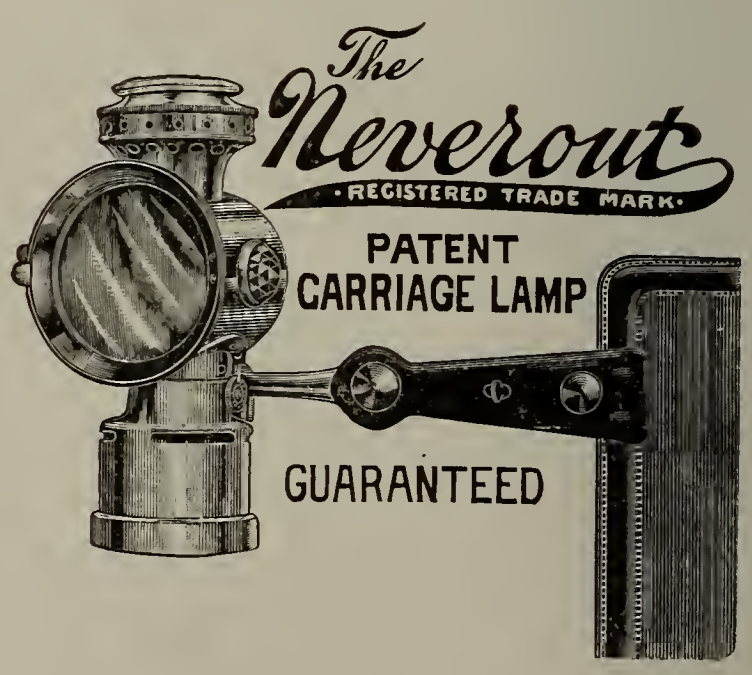
Equipment.—A compartment is made in the dasher in which is carried a complete set of wrenches, etc., such as are needed about the machine. A gong of suitable size and also a large horn such as is in common use abroad is furnished with each carriage.

Weight.—When ready for a trip of 100 miles, with gasoline and water tanks both filled, the automobile with top, weighs under 1,800 lbs., and the automobile with spindle seat about 1,700 lbs.

Automobile Accessories.

THE NEVEROUT PATENT DASH LAMP.

This lamp, which was shown at the Show, is manufactured by the Rose Manufacturing Company, Incorporated, of 910 Arch street, Philadelphia, Pa., and is particularly adapted for automobiles. It burns kero-



sene but is absolutely free from grease. It is simple and elegant in construction, has a patent insulated kerosene reservoir, can be taken apart instantly, has an elbow joint bracket which admits of any adjustment, a patent glass covered reflector and requires no tools or wrenches. It is patented in the United States and all foreign countries and is highly recommended for automobiles and other vehicles.

JOSEPH H. WILLIAMSON, for eighteen years business manager of the Manufacturers' Advertising Bureau, has resigned his position with that concern to accept the position of general manager of the Viennot Advertising Agency, of Philadelphia. Mr. Williamson has grown gray in the advertising business and enjoys a well merited reputation as a conscientious, able and energetic business man, and the many favorable notices he has received show the esteem in which he is held throughout the trade.

TRIAL OF A LIQUID AIR AUTOMOBILE AT THE GRAND CENTRAL PALACE AUTOMOBILE SHOW.

An automobile propelled by liquid air was shown in operation at the Grand Central Palace Automobile Show on the evening of November 26 and caused considerable favorable comment from the large gathering of "sharps" who had assembled to watch the new-comer's advent.

This machine is the second of its kind in existence, a similar one now being in Paris, where it was exhibited and run during the World's Fair. The motive power is simply air, compressed to 2,500 pounds to the square inch, until it reaches 312 degrees below zero. One of the good points claimed for it is that it is not explosive, unless hermetically sealed, and the expansion of this highly compressed air makes the wheels go round. Despite the incredulity of some of the audience, the liquid air automobile moved along as easily as any other machine, and much quieter, there being a total absence of buzzing and spitting so annoying in many other motor vehicles. The chauffeur did not run it very rapidly, however, although a speed of thirty miles an hour is claimed for it. When the cover of the box was lifted the brass tank was completely covered with a thick coating of frost.

This liquid air machine has four-horse power and holds from ten to twelve gallons of liquid air. That is enough to propel it about fifty miles, and the cost is 5 cents a gallon. It is the intention to equip many of the more prominent towns with charging stations, where fresh supplies of liquid air may be obtained, although it is possible to send it in tanks from place to place. The machine ran for over half an hour on the track.

EFFECT OF INCANDESCENT LIGHT ON THE EYES.

The medical faculty of the University of Heidelberg has made a very interesting report on the effect of incandescent light (gas or electrical) on the eyes. After having carefully weighed all the pros and cons of the question, the verdict is that the incandescent light is not harmful. For lighting large halls or places of entertainment, electricity is especially recommended from hygienic points of view.

LORD KELVIN ON ALUMINIUM CONDUCTORS FOR ELECTRIC TRANSMISSION.

The already practically foreshadowed widening use of aluminium conductors for electric transmission purposes adds interest to Lord Kelvin's recently expressed opinion of them. The weight of aluminium required, he said, is almost exactly one-half of the copper which would produce the same effect. The diameter of cable is 28 per cent. in excess of one made of copper, and the cost of insulation for an underground cable is increased in about the same proportion when we pass from copper to aluminium. Aluminium is not a pleasant metal to deal with, but its high conductivity will make it invaluable for overhead transmission. It is true also that the weight to be supported on posts is half of copper, but the surface exposed to the wind is greater, and its strength is not great. The chief drawback to its use, especially overhead, is its liability to become rotten. This defect does not exist if the metal be pure, and especially if free from sodium. But exposure to the atmosphere, especially near the sea, induces deterioration. The fact that aluminium is easily oxidized ought not to condemn it. The same is true of iron and steel, and yet we do not hesitate to place structures of these metals in exposed positions. Only we paint them; so Lord Kelvin proposes that we paint or varnish aluminium conductors wherever necessary. A few hundred yards of 1¼-inch aluminium wire were put up by Lord Kelvin on a Scotch estate somewhat over a year ago, and on this line he is watching the effects of weather.—Cassier's Magazine.

"SEEN FROM THE TRAIN."

It is possible to obtain from even a short journey limitless enjoyment and satisfaction for eye and brain, and that without any exertion except that of connecting facts with places and scenery with history. That fact is well developed by Charles Barnard in a recent article in Cram's Magazine on "Seen from the Train. Travel as a Fine Art." The route chosen by Mr. Barnard as admirably illustrating the idea he wishes to convey is that of the New York Central Railroad from New York to Buffalo and Niagara Falls. Mr. Barnard is a geologist as well as a magazine writer and student of history, and not the least interesting feature of his descriptions are the notes he makes of the rocks and hills and mountains on his line of travel. From point to point he also traces scenes and incidents connected with the early days of American occupation of the New York hills and valleys, and gives brief sketches of persons and places brought to mind with the passing of the milestones.

There is in the article of Mr. Barnard a hint by which the Central, and all other railroads, would do well to profit. What better contribution could be made to the "Four-Track Series" of the Central than an accurate geographical, historical and geological descriptions of the lines, so arranged that the most ignorant travelers would have no difficulty in marking the interesting spots as they passed, and so clearly explained and connected that every earnest student and observer would carry with him from his train an indelible mental picture of history joined to scenery? Such a publication would be educational as well as interesting, and easily might pave the way for sightseers without number. And incidentally it would lead to a permanent cure of the blindness from which the Americans suffer when they travel routes with which they feel themselves to be familiar.—Troy, N. Y., Record.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED NOVEMBER 13, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of five cents.

661,491.—Emergency-brake switch. Wm. Brown, Johnstown, Pa.

661,498.—Electric fuse. Joshua S. Cohen, N. Y.

661,518.—Controlling device for electric circuits. Edward W. Hammer, Chicago, Ill.

661,538.—Brush holder. Christian Kragle, Madison, Wis.

661,588 and 661,589.—Electric welding apparatus. Adolph Rietzel, Lynn, Mass.

661,666.—System of electric train control. Chas. B. Martin, N. Y.

661,714.—Telephone circuit. Josiah H. Farnham, Wellesley and George Davis, Revere, Mass.

661,719.—Rectifier of alternating polyphase currents. Louis Haynes, Newton, Mass.

661,781 and 661,782.—Thermostatic device. Robert G. Callum, Washington, D. C.

661,880.—Electric brake controller. John Lincoln, Cleveland, Ohio.

661,881.—Electric meter. Chas. Little, Heckington, England.

Business News.

NEW INCORPORATIONS.

Exeter, N. H.—Articles of incorporation have been granted to the Rockingham County Light and Power Company, which is capitalized at $350,000.

Anderson, Ind.—The Lea-Hooven Manufacturing Company has been chartered for $15,000 by A. G. Lea, C. Hooven and C. Eastman.

Vicksburg, Miss.—The Southern Light and Power Company has been organized, with $100,000 capital stock, to control electric light and power plants throughout the South. Chicago capital is said to be heavily interested in the new concern.

TELEPHONE CALLS.

Sheridan, Ind.—The Central Indiana Telephone Company was incorporated recently with a capital stock of $10,000.

Albany, Ohio.—The Albany & Vales' Mills Telephone Company has recently been incorporated at $10,000 by local capitalists.

Warsaw, Ind.—The Commercial Telephone Company, of Warsaw, has been chartered with a capital of $30,000. The incorporators and capital are local.

Ironton, Ohio.—The Lawrence Telephone Company has been incorporated to construct and operate telephone lines. The capital stock is $24,000. W. B. Seaton, J. L. Anderson, H. Russell and others were the incorporators.

Salamanca, N. Y.— Local companies have been organized at Salamanca and Akron, N. Y., and will begin the erection of exchanges at both places at once. The company at Salamanca is capitalized at $5,000; that at Akron for $10,000.

Toledo, Ohio.—The Ottawa County Telephone Company, of Oak Harbor, has been incorporated. The capital is $30,000; incorporators: H. Metzgar, E. D. Harkness, J. G. Steinkamp, T. Fuller and F. W. Gradolph.

Jersey City, N. J.—The Exchange Telegraph Company has been incorporated to operate telephone and telegraph lines. The capital stock is $5,000,000, and the incorporators are A. Smedberg, L. B. Dailey, C. W. Perkins and others.

Indianapolis, Ind.—The Northern Indiana & Southern Michigan Telephone, Telegraph and Cable Company, of La Grange, has been formed with $20,000 capital stock; directors: A. J. Hostetter, Rollin Ellison and Alice Ellison. The company will operate in Elkhart and adjoining counties.

Lancaster, Ohio.—The Lancaster Telephone Company was incorporated recently with $100,000 capital stock by F. T. Pomeroy, O. R. Warner, A. E. Akins, M. J. Mandelbaum and J. O. Wilson, nearly all of whom are residents of Cleveland. The company will construct telephone lines in Lancaster and Fairfield County, and also a long-distance line with Cleveland and Lancaster as termini.

ELECTRIC RAILWAYS.

St. Thomas, Ont.—The St. Thomas Street Railway Company has increased its capital stock of $100,000 to $250,000 for the purpose of extending its system to Port Stanley.

New Castle, Pa.—The New Castle & Sharon Street Railway Company has been incorporated, for $150,000, to build and operate an electric street railway between New Castle and Sharon, a distance of twenty miles.

Columbus, Ohio.—Local capital is behind the Lima & Northwestern Railway Company, which has recently been incorporated, with $10,000 capital stock, to construct or purchase a street railway line from Columbus to Weymouth.

Hannibal, Mo.—The Hannibal Railway and Electric Company has been incorporated, with $100,000 capital stock, to construct a railway in Hannibal. E. D. Brewington, E. P. Bowman and H. J. Blathy are interested.

Portland, Me.—The East Bangor & Portland Street Railway Company has been chartered at $12,000, and will lay its lines between Bangor and Portland. The road will be about ten miles long, and construction will begin shortly.

Weyauwega, Wis.—A charter has been granted to the Wisconsin & Midland Railway Company, which has been capitalized at $25,000, to build an electric line from Berlin to New London via Weyauwega, and from Poysippi to Wautoma, by way of Pine River.

Trenton, N. J.—The Lackawanna & Wyoming Valley Rapid Transit Company has been incorporated with $2,850,000 capital stock. The company is authorized to equip and operate railroads. Its incorporators are F. H. Hansell, G. H. B. Martin and W. F. Idell, all of Camden, N. J.

AUTOMOBILES.

Harvey, Ill.—A charter has been granted to the Chicago Motor Vehicle Company, which has been incorporated at $1,000,000 by local capital.

NEW YORK NOTES.

THE NATIONAL MAGNETO ELECTRIC TELEGRAPH COMPANY, of Springfield, Ohio, are exhibiting their new system of operating fire alarm and telegraph lines, railroad semaphores, army telegraphs, fog signals, etc., without the aid of a battery and invite the inspection of those interested. The above system may be seen at the company's New York offices, Park Row Building, 13-21 Park Row. It will be fully described and illustrated in our columns in the near future.

AN INDESTRUCTIBLE METALLIC WHEEL.—One of the novelties at the Grand Central Palace Automobile Show was an indestructible metallic wheel exhibited by Mr. S. E. Cohn. This wheel, which can be used with any sort of tire—iron, solid rubber, hose-pipe or pneumatic—is made of tubular steel and has an hermetically sealed hub which can be filled with enough grease to last for a year or more of ordinary service and is so sealed that no grease can drop out. For further particulars address S. E. Cohn, 177 W. 88th street.



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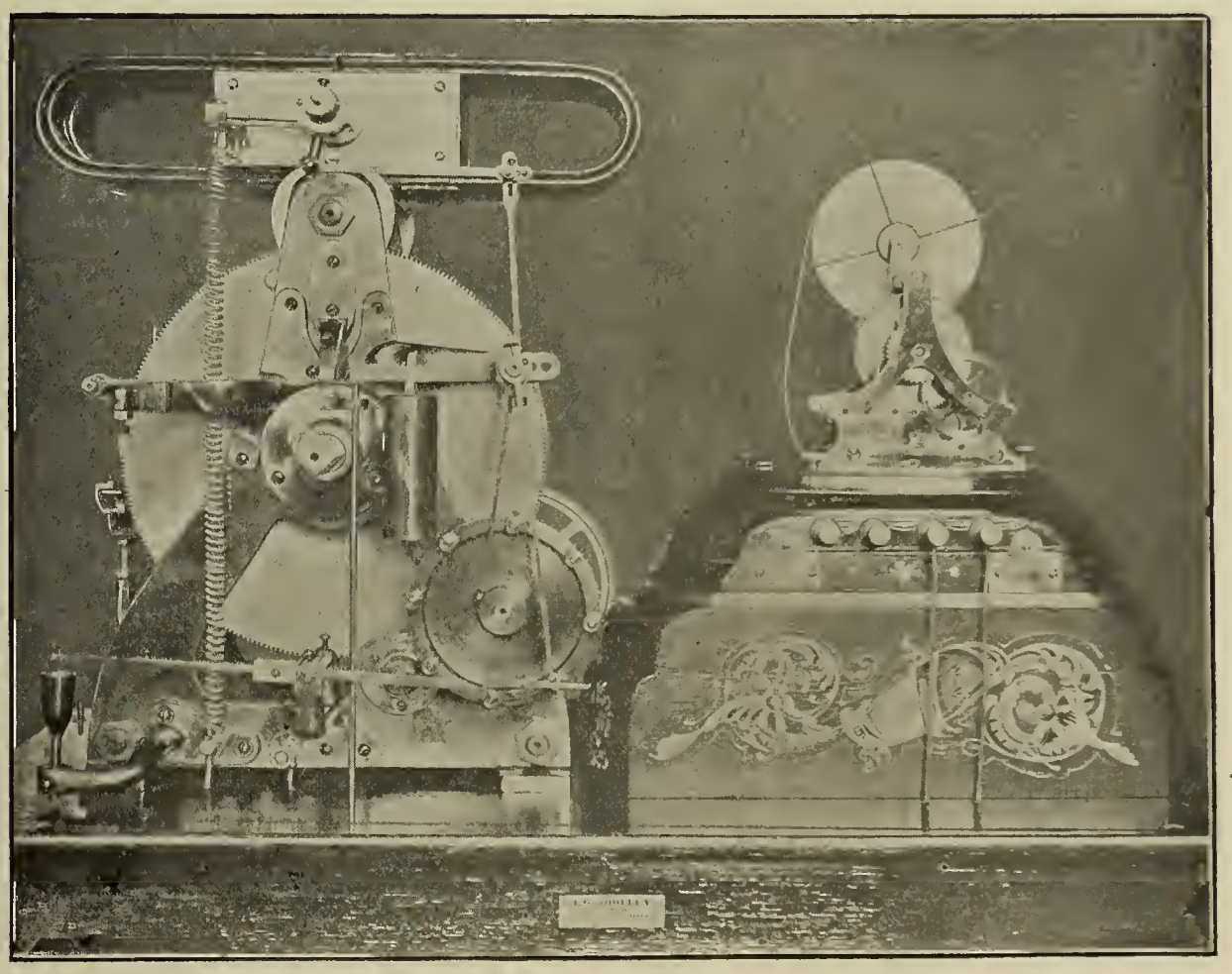
114-120 William Street, Newark, N. J.

BERLIN. European Weston Electrical Instrument Co., Ritterstrasse No. 89.
LONDON. Elliott Brothers, No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI.—No. 22. NEW YORK, DECEMBER 1 1900. Whole No. 707.

Improvements in Methods of Communication.



Line Tester of the Magneto Fire Alarm System.

A NEW MAGNETO-ELECTRIC SYSTEM OF SIGNALLING AND TELEGRAPHING.

A new, ingenious and thoroughly practical system of telegraphing and signalling has been invented and perfected by Mr. L. G. Woolley, secretary of the National Magneto-Electric Telegraph Company, Incorporated. The system and devices referred to may be seen in operation at the New York offices, rooms 704 and 705, Park Row Building. They will not fail to impress the intelligent observer with the idea that a radical departure has been made in the art of electric signalling and telegraphing by the employment of the magneto.

In this system batteries are abolished, the current proceeding from the magnetos employed producing all the effects required where intended. The wonderful advance made by the abolition of battery power is equalled by the improvement in construction and ingenuity exercised in the creation of an entirely new fire alarm system, as well as methods of operating railroad semaphores, the army telegraph, telegraph lines proper, fog signals, etc.

In the illustrations shown the fire alarm apparatus, as it appears in actual perspective and in detailed construction, is brought to the reader's attention. The perfection of this device is due not only to the use of a magneto, through which it becomes independent of batteries, but to the use of a mechanism which continually tests the lines and rings an alarm if they have been grounded or

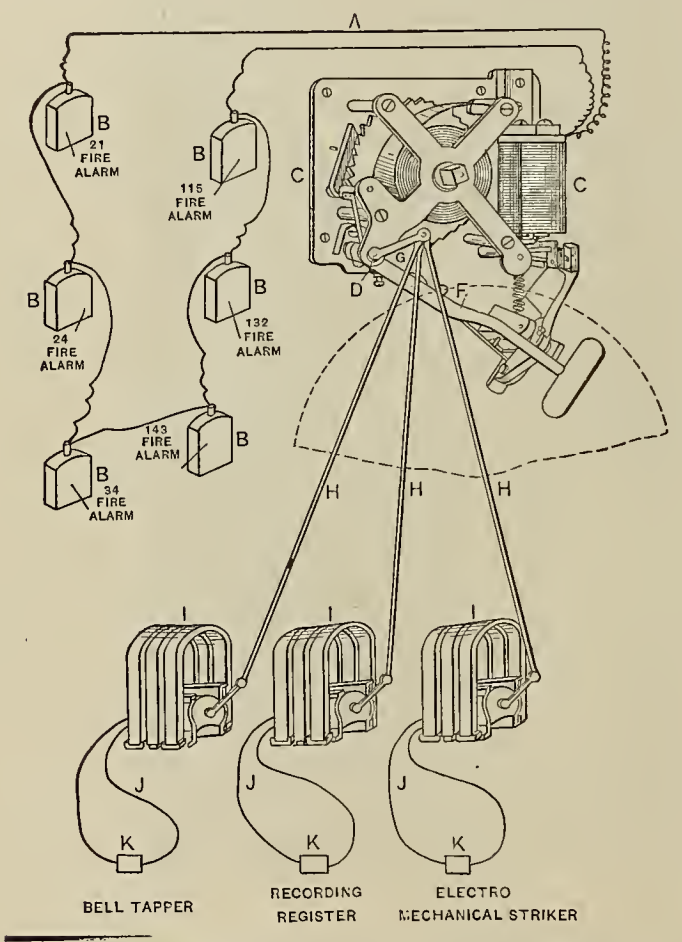
otherwise affected.

The principle made use of here is of a high scientific nature and appeals to the electrical engineer by showing how new applications may be made of old established principles. The inventor uses a magneto which is set into operation by a falling weight at stated intervals. As the weight in falling drives the armature of the magneto, the distance it descends will depend upon whether the armature generates a current or not. If the line is disconnected at any point or otherwise affected the magneto will operate on an open circuit and the falling weight, which is connected so as to produce rotation, will meet with no damping effect from the armature, as it performs no work—not generating any current.

If, however, the circuit is in its normal condition the magneto will generate a current passing through the line. The weight, in consequence, cannot drop as far. In the first case, if the line is broken the weight merely rotates the armature of the magneto without generating any current and, in consequence, falls as low as the mechanism will permit it. When this happens it strikes a little rod and throws a large signalling gong into operation. This gong can operate many magnetos and thereby set into action registers, bells, or other similar devices.

The circuits running from the large gong are shown in illustration connected to magnetos. The circuit testing device above described is normally shunted but the instant before the magneto is thrown into operation the shunt is removed, the magneto operating directly on the line. In this apparatus the descending weight falls upon a flat spring and practically rests there if the line is free from faults. If the line is not free the weight passes the spring and strikes the vertical rod, previously described, operating the bell.

The law of Lenz is fully exemplified in the action of the magneto armature and the falling weight. The law states that in all cases of electro-magnetic induction the induced currents have such a direction that their reaction tends to stop the motion which produces them. Other elements of the system are shown in the fire alarm box, also supplied with a magneto and operated by a key which releases the armature of the magneto momentarily, allowing it to generate a current which operates the regulation gong. In total, this system of employing a magneto to generate the current required in place of batteries is of the utmost advantage, specifically as well as in general. For army service, where lines are hurriedly constructed, it is evident that battery power is neither convenient nor practical to employ in comparison with the magneto. For this reason the future of this system is undeniably great and its introduction will lead to immense developments in the art of telegraphing and signalling. Great credit must be given to Mr. Woolley for his farsightedness and ingenuity in accomplishing in so practical a manner that which will work so radical a change.



Electro-Mechanical Gong and for Relay Magneto Fire Alarm System.

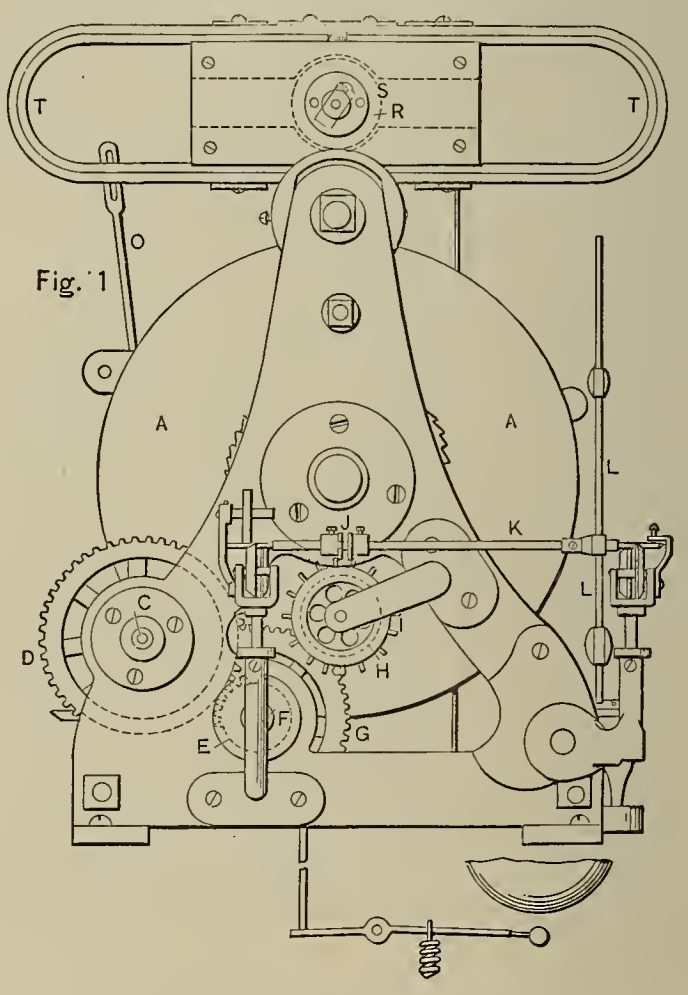


Fig. 1

Line Testing Apparatus for Fire Alarm Circuit.

The National Magneto-Electric Telegraph Company are operating under L. G. Wooley's patents in the United States, Canada, Great Britain, France, Russia and Austria. The officers of the company are: Louis E. Niles, president; W. S. Van Brocklin, vice-president; L. G. Woolley, secretary; Joseph F. Henderson and Major R. B. Hoover. The home office is at Springfield, Ohio.

ELECTRICAL DEVELOPMENT IN JAPAN.

The iron and electrical industries are stated to be undergoing very vigorous development. Japan already possesses nearly 400 electric power works and the electric light has been introduced into almost all the important towns. There are some twenty electric tramway lines now working, while new ones are constantly being projected, and many are at present in course of construction.

THE TELEPHONOGRAPH.*

The telephonograph is a combination of the phonograph with the telephone, and is intended to take and record telephone messages by automatic means, and, to a limited extent, give an answer in the same way. It is the invention of Mr. J. E. O. Kumberg, and an example of the instrument is to be seen at the office of Messrs. H. F. Joel & Co., 31 Wilson street, Finsbury. The combination is simple in general principle, but some ingenious mechanism has been introduced to make the working effective. The message is spoken by the person sending it into the telephone in the usual way, and the vibrations set up by the voice are caused to act upon a recording stylus by the impact of the sound-waves. In this way the wax cylinder in the office of the person spoken to is indented and a phonogram is produced. the same time identical sound waves are electrically conveyed to the receiving instrument at the distant station of the person spoken to, and are there imprinted on another phonogram blank. It is possible to throw the phonograph action out of play and use the telephone in the ordinary way.

Neither the telephone nor the phonograph is perfect in its action, and unpracticed persons are apt at times to experience some difficulty in translating the sounds either one or the other produces into articulate speech; and when the deficiencies of the two are combined difficulty is still more likely to arise, although proficiency is retained to a remarkable degree by practice. In order to overcome this defect a special design of recording diaphragm cell has been devised by the inventor. It consists of a double cell micro-diaphragm having two compartments, one of which is fitted with a multiple, or

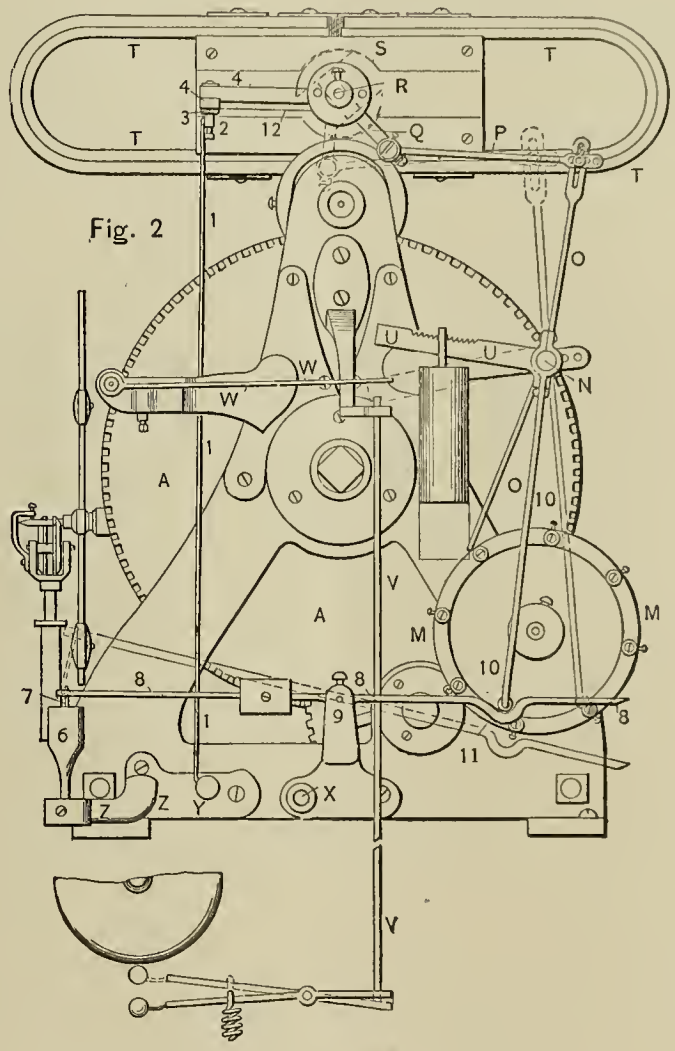


Fig. 2

Rear View of Line Testing Apparatus—showing Levers and Weights.

This, of course, can be read off at leisure in the usual way. The vibrations are transmitted either directly or indirectly, in the latter case an electrical current effecting the object. At highly-sensitive transmitter of any well-known form is used. If it is desired, the instrument may be so arranged that two wax cyliders, or phonograms, may be inscribed, the one being in the office of the sender, to be retained as a record, and the other, an exact duplicate of the first, being produced in the office of the receiver. To effect this end, the transmitter instrument has two channels or tubes for the sound-waves produced by speaking into the mouthpiece. One of these channels leads to the speaking or recording diaphragm of the instrument at the transmitting station, which engraves them upon the phonogram blank. At other suitable microphone diaphragm disc, and the other with a sensitive disc of glass. This receives the undulations produced by the sound-waves and communicates them to the recording stylus. Below the glass diaphragm is a guard, which serves to confine the sound, and also as a shield against the scraping noise which the stylus makes by cutting into the wax cylinder. One of the most important features of the invention is a floating weight controlled by a spring which is attached by means of a pivoted lever and a fine wire to the two discs, already mentioned, of the double cell micro-diophragm. The pivoted lever carries the recording and reproducing tools by which the sound vibrations are respectively engraved upon or reproduced from the wax cylinder. The action of the weight is to give additional power, or perhaps, rather, additional certainty and steadiness to the

*From the London "Times."

reproducing tools. Such weights have before been used to supply what may be described as a fly-wheel effect, thus enabling the cutting tool to overcome any irregularities in the composition of the wax. The weight, however, is apt to rebound through its own momentum, and thus defeat the end for which it is provided. To overcome this defect a spiral spring is fitted in the machine under notice, with the result that the jumping or vibratory motion is damped. It is claimed that by this device a deeper cut is made in the wax cylinder than has been before obtained, and the reproduction of the sound waves is thereby made more perfect.

We lately had an opportunity of testing this invention to the extent of transmitting a message from one room to another adjoining, although the length of wire represented a considerable distance. As reproduced by means of the phonogram, on which the message was recorded, the words were distinctly audible, the result being equal to that of an ordinary phonograph. Mr. Higgins, chief engineer to the Exchange Telegraph Company, has tested the apparatus over a line five miles in length. He reports that under favorable circumstances "articulation is good, the impressions on the cylinder being as deep as the impressions made when speaking into an ordinary phonograph." Large battery power was needed and a reinforcing current is required at the receiving and registering line.

In regard to the practical utility of the apparatus those who had experience with the telephone and the phonograph will be able to judge from the description here given. It would be most applicable in small offices where a limited staff is employed. Thus if the office is left without an attendant and a call is made the phonograph can be so set as to reply, "Mr. ——— is out. The instrument is fitted with a telephonograph which will automatically take down any message you may send and Mr. ——— will read it on his return." The arrangement of the mechanism is such that any number of messages up to an aggregate of 15,000 words may be taken in this way.

New Publications.

THE POWER QUARTERLY.

(The Power Quarterly, Gas Engine Edition, 76 pages, 25 cents. The Power Publishing Co., New York city.)

We have received No. 1, of volume 1, of the Power Quarterly, issued in magazine form. This is the Gas Engine Edition and has been issued to fill a demand for recent copies of Power containing matter on this subject. The Quarterly contains a complete synopsis of the gas engines in foreign countries, as shown at the Paris Exposition, including a description of a gas engine operated by blast furnace gas, (18 pages, 49 illustrations); a technical description of the leading American gas engines, (23 pages, 77 illustrations); a reprint of the serial in Power on the principles of the construction and operation of gas engines, (20 pages, 30 illustrations); an illustrated description of a producer plant for the manufacture of gas for gas engine purposes; editorials on the efficiency of the gas engine and its commercial advantages, and other matter relative to the industry.

The articles are of Power's usual high standard of excellence, it presents an attractive appearance and will, no doubt, be received with the same favor as its parent.

Electric Railways.

EXPERIMENTAL RUN OF AN ELECTRIC TRAIN ON THE MANHATTAN "L" ROAD.

Several preparatory trips were made last week on the Manhattan Elevated Road with an electric train under the direction of W. E. Baker, general superintendent of the elevated road, and the success attending them was most complete. The train consisted of two motor cars, one at each end, and four coaches in between. It was run out of the Sixty-seventh street yard with Master Mechanic Doyle at the motor, and was switched over to the uptown track in between two passenger trains. Then it started uptown and developed with ease seventeen miles an hour. It ran with the greatest smoothness and was started and stopped in half the time required by the steam trains. Occupants of the houses along the road hung their heads out of the windows in joyful surprise, for at sight of the quiet but swift moving train they realized that the day of the puffing, cinder casting steam engine on the elevated was over.

In the opinion of the experts there was much less rocking of the road's structure than with the steam engines, although the motor cars are much heavier than the engines. The motor cars weigh thirty-five tons, to from twenty-three to twenty-eight tons for the steam engines, but their weight is much more widely distributed along the track, owing to the greater length of the motors. The current used was obtained from the Third avenue power house and the motors developed 1,208 horse power. With such power, of course, it would be possible to go much faster than seventeen miles an hour, but it is not deemed wise to increase the strain on the structure, which such speed would naturally bring.

The only part of the elevated system which has been fitted for the use of the third rail system is the stretch on Second avenue between Fifty-seventh and Ninety-second streets but preparations have been pushed so far that it is said the rails can be laid at the rate of a mile a day as soon as the word is given. The Second avenue line, which is to be equipped first, will require eighty-four motors and the making of these will require some time. Four hundred motors will be used on the whole system.

The engineers and firemen on the Second avenue line have received notification from the company that when electric motors replace the steam locomotive they will be discharged and re-employed as motormen, if they wish, at $2 a day. The men, of whom there are about two hundred, belong to the Brotherhoods of Locomotive Engineers and Locomotive Firemen, and their wages are $3.50 and $3 a day, the regular union rate set by the two brotherhoods.

ELECTRICITY ON THE CONGO.

What promises to be the first electricity station in the Congo district is soon to be started at the Roman Catholic Mission of Luluabourg, which is situated on the River Lubia, a tributary of the Kaosas river, which is itself a tributary of the Congo. The head of the mission, Father Gambier, who has for several years been in Luluabourg, is now proceeding there again, taking with him a dynamo, turbine, lamps, cables, wires, etc. He proposes to obtain the necessary power from a waterfall, the fall being some twenty-eight feet high. The dynamo will light 150 lamps, and it is proposed to install 100 incandescent lamps and three arc lamps. The dynamo was manufactured by a firm in Charleroi, and the turbine is of French construction.

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NEWTON HARRISON, E. E. Editor.

Walter Mueller, Managing Editor.

ASSOCIATE EDITORS.

Electric Light and Power.

Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.

Electro-Therapeutics.

Joseph Muir, M. D.

Frederick Strange Kolle, M. D.

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THE ELECTRICIAN AND MOLECULAR PHYSICS.

A reconciliation is about to be established between the chemist, the physicist and the investigator of electrical phenomena. Prof. Fessenden claims, with J. J. Thomson and others, that the atom is a monolith of matter in comparison with the ion. This recently discovered electrified particle is supposed to be less than one-thousandth of the mass of a hydrogen atom. Recent discoveries have shown without a doubt that the masses of ions of different materials are identical, though differing in atomic weight.

If these statements be placed in apposition with facts of a more familiar nature a new field of investigation opens up to the eye of the scientist. Problems that have arisen in astronomy in reference to accumulations of nebulous matter called nebulum; other questions that have arisen in connection with the ultimate constitution of matter; the true nature of electrolysis; the cause of chemical affinity; of permanent magnetism, in fact, questions of the deepest importance to the world of science may be answered with an explicitness that had never been expected when this new kystone to the arch of general scientific investigation will be properly adjusted.

The latest department of science now deals with the ion. It may prove, as some have suggested, to be merely a centre of force. It might, as others have concluded, be merely a form of differentiated ether. On the other hand, the ion might be a particle of original world matter which, when acted upon by laws of which at present we have no cognizance, may, in obeying them, produce all the varied phenomena of nature in the world of inorganic types. It seems as though a point has been reached at which all the sciences co-ordinate. The outcome of this new trend of thought will best be judged by the work of future aspirants for honors in the twentieth century.

A GOLDEN OPPORTUNITY FOR A COMIC OPERA LIBRETTIST.

Heretofore our native comic opera librettists have sought the material for their productions abroad, possibly for lack of a sufficiently humorous series of incidents around which to weave their plots. The lack of sartorial elegance may possibly also have had its effect, the tiller of the soil or even the staid business man hardly presenting the picturesque appearance of an assemblage of Spanish troubadours, Italian gondoliers or Tyrolean mountaineers.

However, despite these drawbacks, we venture to believe that the incident mentioned in the following dispatch would furnish material for a laughter-provoking comedy of the highest order: "President Doherty, of the village of Bellwood, Illinois, who impressed a posse and arrested nine telephone linemen who were attempting to string wires through the village, declares that while he is President of the village Bellwood will be without telephones. He made the declaration that, "They are no good, and we get along very well without them. After I am out of office telephone wires can be put up in any place, but there will be none in Bellwood while I am in office."

What a figure the progressive President of the village would present, chanting his lay of the iniquitous telephone; the linemen ordered to be thrown into the deepest dungeons—to meditate upon the fourteenth century spirit of the worthy executive; the chorus of the supplicant directors of the telephone octopus, begging for mercy for having dared to attempt the introduction of the telephone into the calm and peaceful precincts of Bellwood.

The gentleman utters sentiments worthy of the monks of Queen Isabella's court, who scoffed at Columbus and his plans for reaching India. Coming, as they do, from the lips of a citizen of the State which has given birth to more telephone enterprises than any other State in the Union, they are still more remarkable and hardly recommend the spirit of the citizens of a town of the energetic and enterprising West in selecting as their representative a man entertaining the opinions of the Honorable Doherty.

DYNAMOS AND ENGINE ROOM TEMPERATURES.

If ventilation in an engine room were only of importance as far as the health and vitality of the engineer was concerned proprietors of large buildings might express ignorance as to the true condition of affairs prevailing, but if they realized that the dynamos installed are operating under a disadvantage when such conditions exist possibly their investigative tendencies might be stimulated to an extraordinary degree. A generator built to operate at a normal temperature is considerably handicapped by being forced to run under what might be otherwise considered a heavy load. The rise of temperature allowed for in the specifications is frequently exceeded on account of the conditions being as we have described. The limit to the operation of a generator is entirely dependent upon the range of temperature through which it can operate and in consequence the advisability of keeping the engine room, or, at least, the dynamo, as cool as possible is strongly accentuated in the light of this fact.

Stray Currents.

CAPITAL INVESTED IN CANADIAN ELECTRIC RAILWAYS.

The amount of paid-up capital invested in electric railways in Canada is $21,700,000. The electric cars traveled over 4,383,000 more miles than the passenger and mixed trains of the steam railways. Together, the steam and electric railways carried over 120,000,000 passengers, and the proportion was about 13 by steam to 87 by electricity.—Ex.

ELECTRIC POWER IN ROUMANIA.

At Sinaia, the summer residence of the King of Roumania, a fine water power on the river Prahova has been developed, and its energy will be transmitted twenty-nine miles and distributed to a number of industries in the lower valley of the river. In the extensive petroleum fields in the neighborhood a considerable demand for current has arisen. A high tension system of distribution is used, the pressure on the main transmission circuits being 11,000 volts.—Ex.

TELEPHONES IN RUSSIA.

According to some recent statistics, there were in Russia an aggregate of some 35,000 miles of telephone wires—about half state and half private concerns. In the Baltic provinces there are some large telephone systems, but they do not appear to be altogether satisfactorily constructed, inasmuch as the different lines, which are frequently of considerable length, have no connection with each other. This is attributed mainly to government restrictions where state telephones already exist. —Ex.

ELECTRIC FURNACES.

In a paper read before the International Electricity Congress at Paris, Mr. Keller dealt with the subject of electric furnaces. These he divides into three types. In the first, the heating is effected by an arc, as in the original Siemens furnace, and in the laboratory furnaces so skilfully used by Mr. H. Moissan. In the second class come the resistance furnace, such as used by Heroult, whilst in the third are incandescence or multiple arc furnaces, as introduced by Cowles. The furnaces of the second type are said to be the best adapted for the production of carbide, as, though heavier currents are needed than with arc furnaces, fusion is effected quietly, and there is no very violent evolution of gas. In these furnaces the charge itself acts as a conductor for the current between the electrodes. Alternating currents are now very largely used for working electric furnaces. The size of these furnaces is at present limited by the difficulty of obtaining carbons of sufficient size for the electrodes. As matters stand, some furnaces take currents of 10,000 amperes, and require carbons of corresponding size.—Ex.

WIRELESS TELEGRAPHY EXPERIMENT.

A curious experiment in radiation telegraphy, in which the human body plays a part, is described by Guarini and Poncelet. In ordinary experiments, the coherer may be hit by direct and also by reflected radiations; they took care that their coherer received direct radiations only. Their transmitter was worked with a Wimshurst induction machine; the receiver was only a few yards from the transmitter. Now, they observed that when one of them stood between the transmitter and coherer, all action ceased, although the body was insulated from the earth. If an iron screen was interposed, the coherer continued to act, as long as the screen was insulated; when the sheet iron was joined to earth, the radiations evidently passed down into the ground. Apparently, the insulated iron screen becomes, by induction, itself a radiator on the surface turned towards the coherer, and this induction is stopped by joining the screen to earth.—Ex.

SMALL ELECTRIC AIR PUMP.

The electrically operated air pump of Emerson's invention is a small air-compressing outfit for physicians' use with atomizing tubes in treating mouth, throat, and lung diseases, and is also adapted for dental purposes. A single-acting air pump is driven by an electric motor by a cord passing around the rim of the fly-wheel, and at the end of the short shaft is a disc which operates the pump. The latter is connected by a short length of hose to a six-gallon nickel-plated tank, which has a gauge on the crown to indicate the pressure, and stop cocks with hose connections for leading off to the atomizing tubes, etc. No permanent fixtures are necessary for fitting up this outfit as all that is necessary to start it in operation is to plug in the lamp socket, the same as an electric lamp or an electric fan motor. The expense of operating the pump is very small.—Ex.

ELECTRIFICATION IN LIQUID AIR.

Why liquid air should electrify bodies dipped into it will not at once be apparent, and yet experiments seem to establish the fact. According to H. Ebert and E. A. Hoffmann, the air is not directly responsible, however. If a piece of metal is suspended and moved in liquid air, it will, under ordinary circumstances, become negatively charged; but if the air was filtered, no electricity will be observed. The electrification is really due to the particles of ice which float in the liquid air. Whether the body is a metal, or a piece of glass or sealing wax, does not matter at all. The authors have constructed a kind of liquid air frictional electric machine, by passing a current of liquid air through a glass tube in which a rolled-up spiral of wire netting of amalgamated copper is placed. The liquid air carries sufficient ice with it to produce the necessary friction, it cools that ice and keeps it dry, that is, free from adhering moisture. The obser-

vations are interesting for meteorologists. That the higher clouds consist of ice particles has long been known, and that they have something to do with the generation of atmospheric electricity was pointed out by Sohncke in 1886, in his theory of thunderstorms.—Ex.

A HEATED INSULATOR.

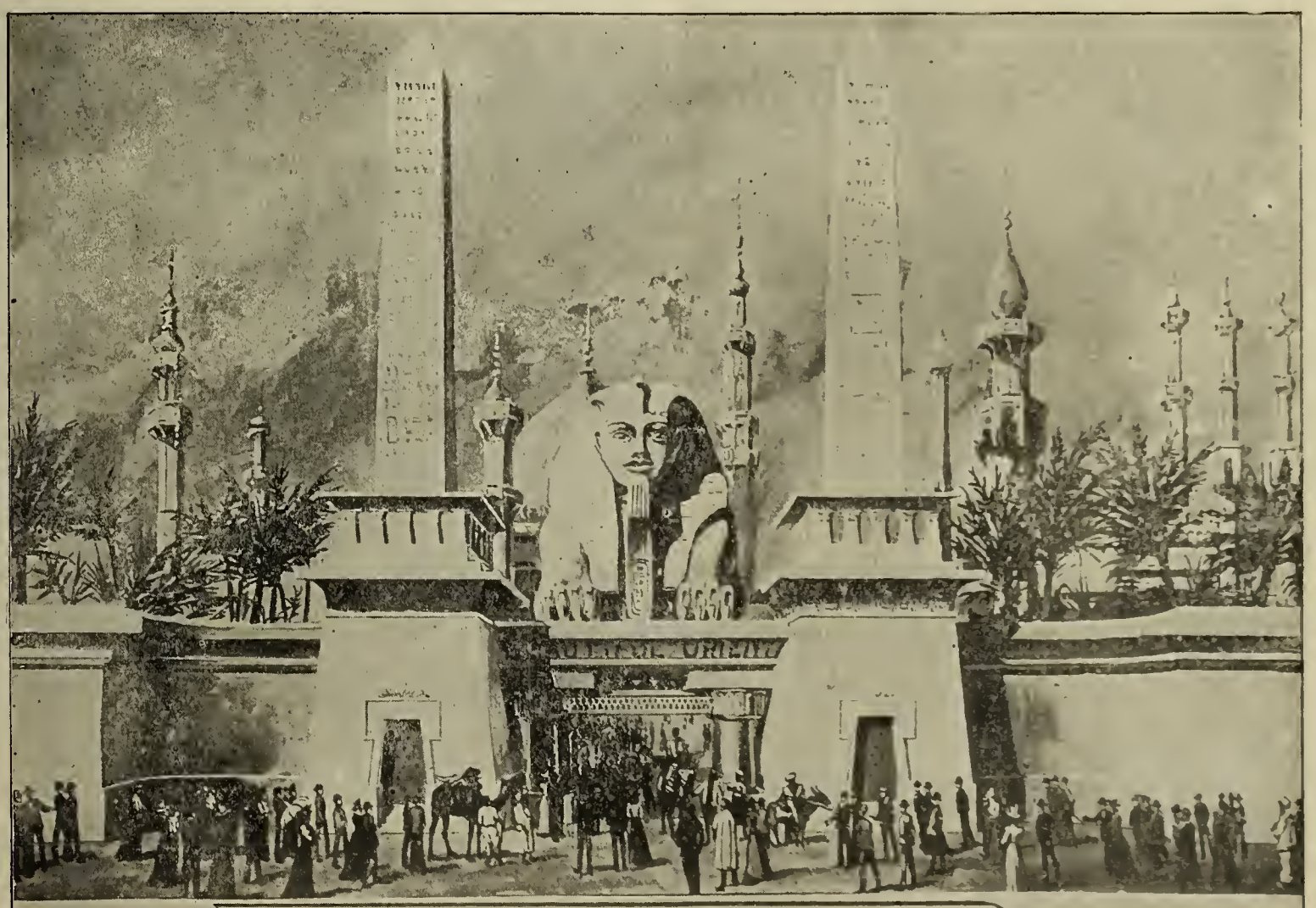
A new form of high voltage insulator, designed to overcome the condensation trouble, has been patented by a Mr. Larsen, of Frederiksvaern, Norway. When very high voltages are used on overhead lines, it is not always possible to prevent considerable leakage, due to the condensation of moisture on the surface of the porcelain or glass insulators. Mr. Larsen proposes to prevent this condensation by maintaining one portion of the insulator at a higher temperature than the air. The author believes that 1 deg. C. would be sufficient increase of temperature to prevent the moisture in the air condensing on one part of the insulator, as it will always choose the colder portion on which to be deposited. In order to obtain the heat at the part requiring it, a resistance coil is inserted into a cylindrical recess which is formed in the porcelain. This resistance wire can either be supplied with a current by means of an independent circuit, or, when the main current passing along the high voltage conductors is alternating, the heating current can be obtained by a small local circuit energized by induction. Of course the energy required is quite small, so that it hardly enters into consideration when a large amount of power is being transmitted.

The Pan-American Exposition.

THE BEAUTIFUL ORIENT.

Nearly three millions of dollars will be required to construct and equip the wonderful Midway at the Pan-American Exposition. The greatest care has been taken to prevent any approach toward the "fake" show and the visitor may rest assured that he will not be submitted to fraud or extortion so long as he remains upon the Exposition grounds. It is difficult to single out any attraction in this section as more prominent or worthy than another, for all have their special merit and novelty.

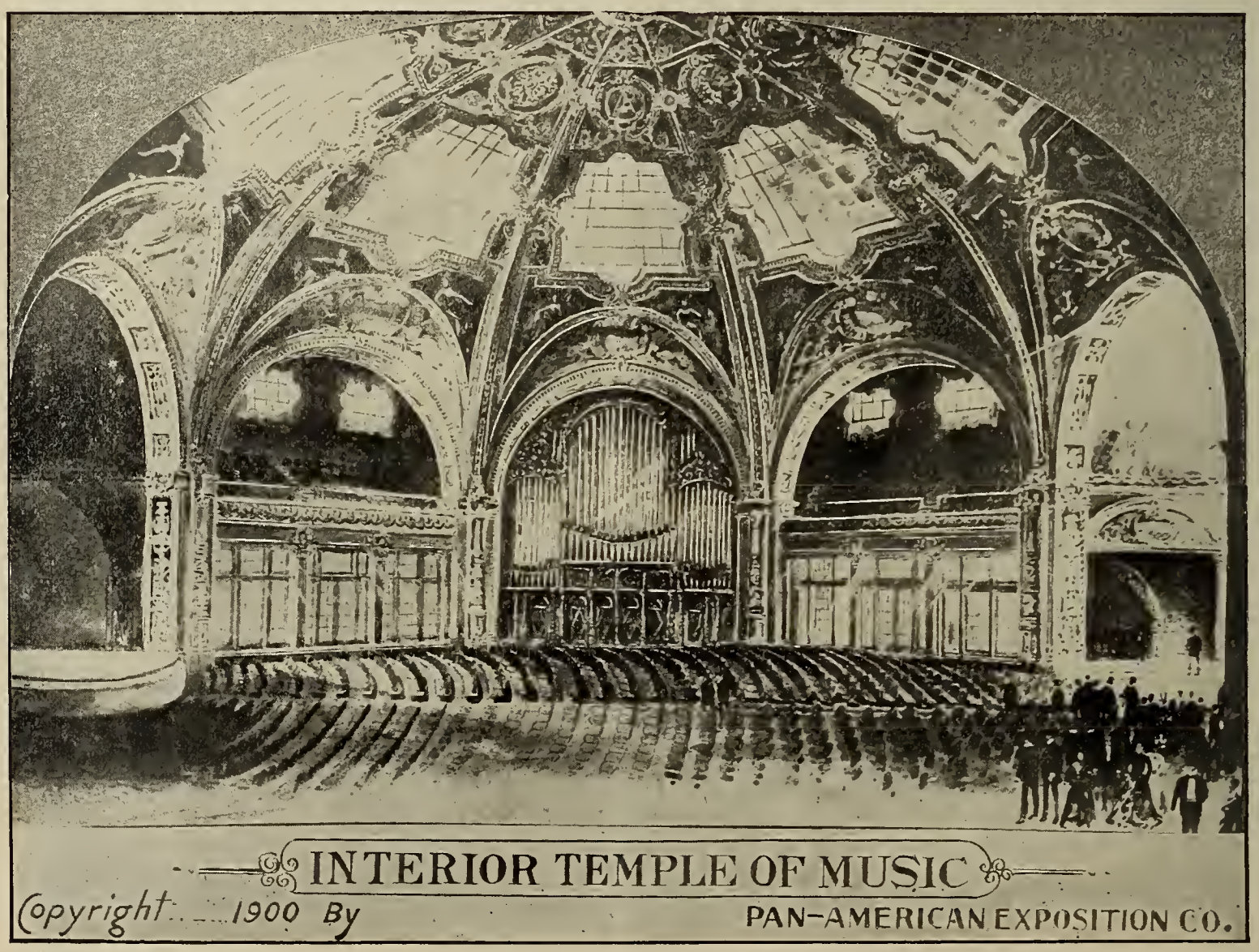
The subject of the accompanying illustration, the Beautiful Orient, will represent life as it existed in the East before the advent of the modern tourist. Gaston Akoun, director of this concession, is arranging to have native representative characters to convey proper impressions of Oriental customs and manners of living. He will have plenty of room in which to display the different salient features that would appeal in the strongest terms to people accustomed to our western civilization. A holy Mecca will be the meeting place of tired and worn pilgrims who will constantly arrive, make their offerings in the various mosques or religious temples and disperse. Eight streets will diverge from this objective point, each representing a distinctive local section of the Orient. A street in Constantinople will be thoroughly Turkish, even to the vagabond dogs. Morocco will be represented by a street which will illustrate the life and habits of the Moors. Algerian life will receive attention



THE BEAUTIFUL ORIENT ON THE MIDWAY.
PAN AMERICAN EXPOSITION

and a street will be borrowed from Algiers for the purpose. Typical illustrations in a like manner will be taken from Egypt, Tunis, Persia, Tripoli and Turkey in Asia. While looking through these sections visitors could easily imagine themselves in the midst of the ancient city, the counterpart of which they are visiting.

A Bedouin Arab encampment will lend variety and Sahara Desert nomads will live in their interesting characteristic way. Natives from all countires will live on the grounds with their camels and different domestic Oriental animals, cabins, tents and huts. Restaurants, tea houses, shops and fruit stands for the sale of Oriental goods of great variety will be provided. The Beautiful Orient is under the same management as the Streets of Cairo, which was so popular at the World's Fair, though it will be three times as large. About 300 Orientals will be employed in different ways with this attraction, a conglomorate eastern city with distinct local features—a history in a nutshell.



THE TEMPLE OF MUSIC.

One of the chief architectural features at the Pan-American Exposition will be the splendid Temple of Music. This will be the center for musical interests at the great All-American Exposition. Music lovers will naturally wend their way to this building very soon after arrival upon the grounds, and both here and from the band stands in the great Esplanade and in the Plaza they will always find some entertainment in progress which will appeal to their love of musical art. The Music Temple is well along toward completion. Its architecture is a free treatment of the Spanish Renaissance, it being octagonal in form, with pavilions at the corners. The grand entrance is at the corner of the Esplanade and Court of Fountains, the spacious courts upon which most of the principal buildings of the Exposition have their frontage. The cornice and balustrade are of elaborate composition, the latter bearing names familiar to the musical world. The interior of the temple will be particularly fine in its sculptural and color decorations. The exterior of the building will be ornate in architectural features and groups of sculpture designed to illustrate the purpose and character of the building. A dome whose crown is 136 feet above grade and whose interior is brilliant with golden tints and other rich hues gives an imposing finish to the structure. Star-shaped windows in the drum of the dome admit abundant light to the large auditorium. This will seat 1,200 persons, and with the additional seating capacity afforded in the balconies fully 2,000 persons can be accommodated. The decorations of the interior will illustrate such subjects as the grand divisions of Music, Oratorio, Grand Opera, Symphonic Music, etc. The sculpture, by some of the most noted sculptors in America, will typify such subjects as religious music, lyric music, gay music, heroic music, etc.

Kingfisher, Okla.—A bond issue, amounting to $26,000, has been voted for the purpose of putting in an electric light plant for public illumination, and it is expected that active construction work will be begun within a very short time.

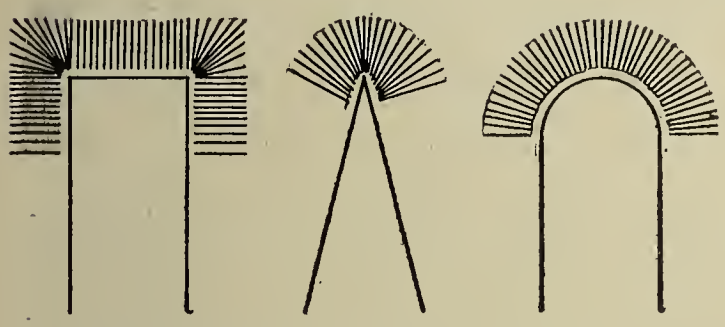
Technical Notes.

The dynamo without a commutator, supplied merely with two collector rings, generates an alternating current. The one hundred and ten volt machine may be readily transformed into a low frequency alternator by the use of a pair of collars insulated from the commutator but connected to it at two points diametrically opposite to each other. A sketch is shown of an alternating current wave in contra-distinction to the pressure generated around the commutator when the potential is properly distributed.

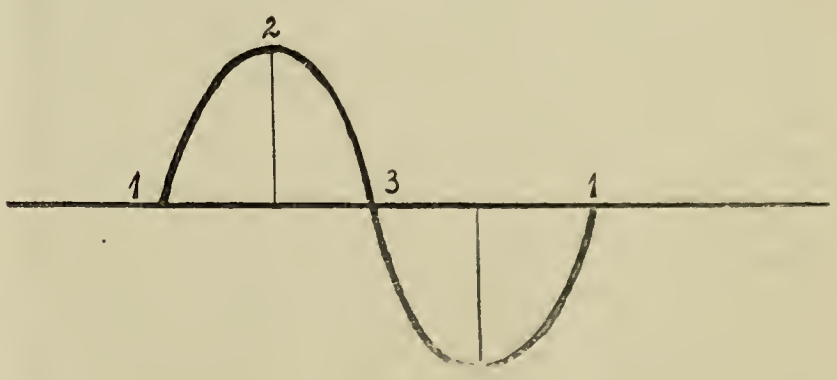
With a uniform distribution of potential around the commutator the conditions suggested by theory are faithfully borne out and it is possible to investigate these conditions by employing a voltmeter, one wire of which is attached to the positive brush and in place of the negative brush the other wire is slid around the commutator and records taken of the pressure each additional commutator bar away from the positive brush. The curve obtained would be like that shown.

In the two types of armatures generally employed, the ring and drum, we meet with conditions that operate unfavorably unless properly considered. A drum armature generally operates at a higher speed than a ring armature. It has the disadvantage of having all wires of opposite potential crossing and intertwining with each other. On the other hand, the ring armature is so wound that coils of greatest difference of polarity are widely separated. An examination of the sketches will make this obvious.

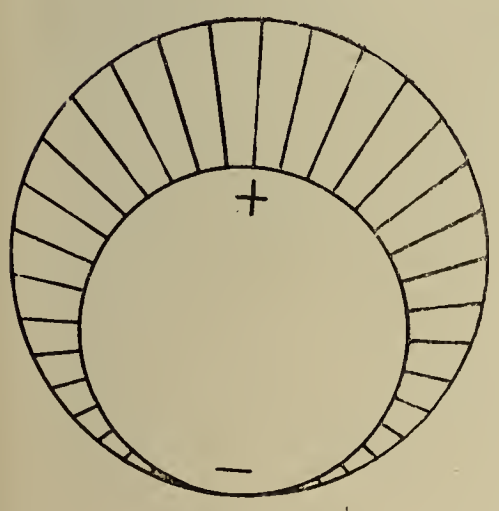
Certain difficulties occur in the fields through an unequal distribution of the lines of force, causing variations in the pressure and possibly sparking. An examination of the three sketches showing the distribution of lines of force at corners, points and curved surfaces, will show the necessity for making the magnetic circuit as free from protuberances as possible. Curves are more essential than corners and points are to be entirely avoided.



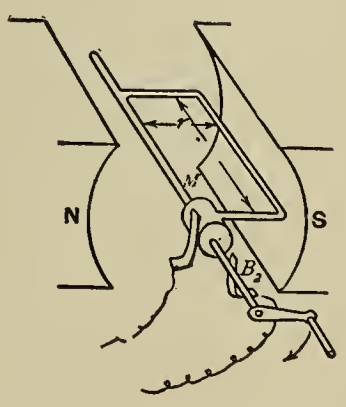
Distribution of Lines of Force at Corners, Points and Curves.



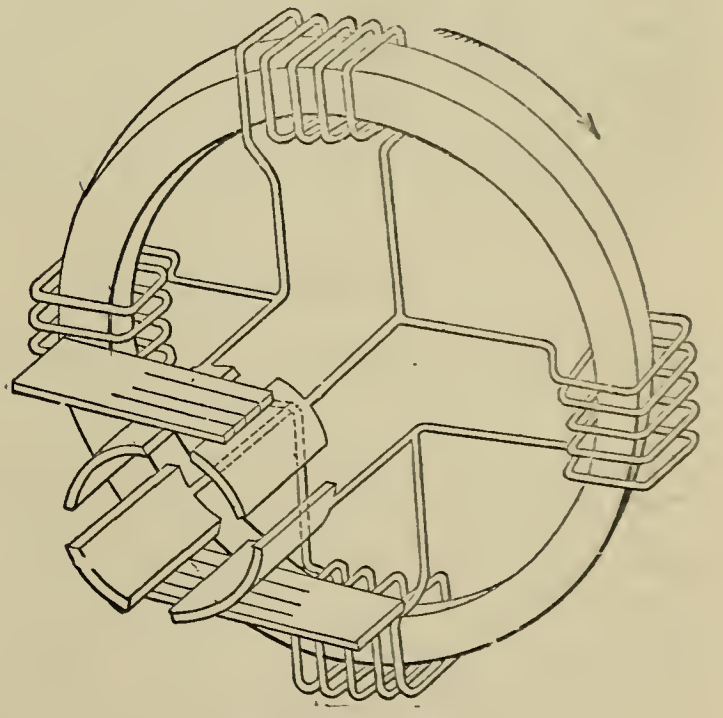
Alternating Current Wave.



Distribution of Potential Around Commutator.



Ideal Dynamo.



Ring Armature.

The Electric Light.

THE NERNST LAMP.

It is rather singular, says the British Journal of Photography, that so little is heard of the Nernst electric lamp, especially in connection with photography. The first use of electric light for studio work on an important scale was on the arc principle, but, latterly, many incandescent light installations have been adopted; each style has its advocates. The latter system is so very simple that it is bound to find favor: a switch equivalent to the tap of a gas burner is turned on and the light is at once ready for

use, while with the arc either a special adjustment has to be made each time the light is restarted, or, in the case of an automatic lamp, some little time has to elapse for the light to settle down to a steady value. But much greater intensity and consequent reduction of exposure is better obtainable with the arc than with the ordinary incandescent lamp. The Nernst lamp, however, much more nearly approaches the arc light in intensity of light and in its actinic value.

It is true that the Nerst is, on account of its more complex construction, more costly at the outset, and that its life is shorter than the ordinary carbon filament lamp. But against this we have first to reckon that the company who run the new lamp will allow two-thirds its value if returned when a new one is purchased; and, secondly, the consumption of electricity is less. The power employed in the present type of lamp is from 1½ to 1¾ watts per candle, and an ordinary lamp needs about double this. It will be remembered that light is produced by the incandescence of a filament of refractory oxides. When cold, this filament will not permit the current to pass, but, when heated first, it becomes much less resistant, and the current causes it to glow at a much higher temperature, and consequently increased brilliancy than the carbon can sustain.

In the first lamp made the preliminary heating of the filament was brought about by a match or a spirit lamp, but as this involved the very practice that the older incandescent lamps were supposed to have banished—the striking a match, etc.—another more intricate form of lamp was designed in which the first heating was brought about automatically by a spiral of platinum wire coiled round the refractory oxide filament, the current then being switched off automatically when the filament was heated, the lamp giving a brilliantly white light. The average duration of a filament is 300 hours, but this is governed by the mode of use. Thus, if the light be rushed, as it were, and the full intensity quickly produced, it does not last so long as when a little time is allowed for the full brilliancy to be obtained.

Miscellaneous.

THE CONDUCTIVITY OF TELEGRAPH CABLES.

There has been some question as to the reason why certain cables lose their conducting properties, and have, in some instances, to be replaced. Mr. Rheims, in a paper submitted to the Academie des Sciences, states that when cables lose their electrical properties it is because they are always used for one kind of current only, either positive or negative. If used sometimes for positive and sometimes for negative, they will, he states, preserve their conductive qualities indefinitely. He illustrates this by an observation on an underground line between Paris and Dijon, the line having nine wires. Of these, wire No. 7 received alternately positive and negative currents. This line kept its conducting properties, while the eight other wires, which were used with Morse and Hughes instruments, and only received positive currents, had all lost more or less of their conductivity. The remedy for this loss was stated to be obvious—namely, that all currents sent in one direction should be positive, those in the contrary direction being negative, thus destroying the action of the first current by that of he second.—Ex.

ELECTRIC RAILWAY TO PEKIN.

The much-mentioned railway from Tien-Tsin does not come quite up to Pekin. The authorities would not have the terminus nearer than one and half miles from the Southern Gate. But it was recognized that some further connection was needed, and so an electric railway from Ma-chia-poo up to the city gate was permitted. To get to the center of the city would mean another one and half miles, and that concession has not yet been made. The electric railway was built by Siemens and Halske on the full gauge plan. There are now, or were before the present troubles broke out, four motor cars with as many trailer cars. The whole equipment is that of the ordinary Siemens lines, with overhead wires and contact lyres. The track is single. The power station contains two non-condensing, vertical triple expansion engines, each of 75 horse power, running at 275 revolutions. Those engines come from the Paucksch works at Landsberg, and are so-called capsule engines, being all encased to keep the dust of the dust storms off.—Ex.

Generation of Electric Power.

ELECTRIC UTILIZATION OF WIND POWER.

The often attempted utilization of a windmill as primary motor for a dynamo, charging an accumulator battery, also involves complications in the electric connections, to guard against the sudden fluctuations in the primary power, which have proved a serious obstacle to the adoption of this system of power generation. It has generally been thought necessary to provide for automatic disconnection of the dynamo, lest, with decreasing wind and dynamo speed, the accumulator EMF might overpower the EMF in the armature. In a so far successful plant which has been put up at Wittkiel, in Schleswig-Holstein, this difficulty has been obviated by the special construction of a wind turbine of large dimensions and inertia. It has a diameter of 39 ft., an effective area of about 1,000 sq. ft., and its normal speed of 11 revolutions per minute is maintained by automatic adjustment of the vanes. The turbine can develop 30 h. p. It is coupled with a steel dynamo of the Gustav Conz Electrical Co., of Hamburg. The dynamo gives 160 volts and 120 amperes at 700 revolutions. It is switched in when the wind velocity exceeds 8 ft. per second. The field is excited from the battery, the positive pole being permanently connected with the batery, whilst the negative terminal is joined to the charge regulating cells. The dynamo is regulated in this way, and no manual adjustment is said to be required. A regulator in the discharge circuit of the battery keeps the tension at 110 volts for the incandescent lamps. Small electric motors are driven from the lamp circuit; large motors have special direct connection with the dynamo. The installation is said to work well, and it is contemplated to put up several such plants for an electric central station.—Ex.

The Automobile.

ACCUMULATOR TRACTION.

Concerning the competition of electrically-propelled vehicles which took place in Berlin a few months ago, Dr. M. Kallmann's report supplies some useful and interesting data. The battery taking the first honors weighed only 121 lb. per kilowatt-hour, while the heaviest weighed 286 lb. per kilowatt-hour. The mean value for the thirteen vehicles taking part in the competition was 165 lb. Dr. Kallmann expresses the opinion that the cost of the battery for a passenger car to travel 19 miles with one charge will amount to about $250. Upon the assumption of a yearly total mileage of 9,500 miles he calculates the annual maintenance cost of a bat-

tery at only 96 cents, or say 2 cents per mile. The smallest consumption of energy per ton-mile at the mean speed amounted to 91 watt-hours for a passenger car, a far better performance than previous records are able to show. At the highest speed the consumption increased to 135 watt-hours. However, in the majority of cases, the demand did not vary greatly with the speed, which leads to the conclusion that, in order to obtain the greatest commercial economy of energy, the electrically-propelled car should be driven at the highest speed consistent with public safety. By the high speed the consumption of energy per car mile is not considerably increased, while the number of passengers which may be transported in a given time naturally increases with the speed. With regard to the motor best adapted for the weight to be propelled,, Dr. Kallmann gives it as a rule that the capacity of the motor should amount to approximately 1 kw. per ton of the rolling weight.—Ex.

UP TO DATE SERVICE.

Every New Yorker is interested in each move made by the New York Central to improve its magnificent service, and in the eyes of the average stranger, whether native or foreign, the New York Central is an example of what the Empire State of the Union can do. We therefore note with pride the up-to-date character of the dining care service on the great four-track line. In a menu on one of the afternoon trains from New York recently we noticed "broiled breast of prairie chicken with currant jelly" among the list of delectable viands prepared for its patrons. Its pure spring water from the foothills of the Adirondack mountains, served free, is another delightful idea and on the Empire State Express they are now serving almost every dish that you could get on an a la carte dining car and those dishes are hot and appetizing. Recently broiled bacon with eggs and broiled ham with eggs have been added to the menu. This, it will be understood, is on a train where the travel is so heavy that it is almost impossible to haul a dining car, but with their new buffet broiler service the Central is handling it in splendid shape.—Albany Press-Knickerbocker-Express.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.
PATENTS ISSUED NOVEMBR 20, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of five cents.

661,971, 661,972 and 662,039. Control of electric motors. Frank W. Garrett, Johnstown, Pa.

661,988. Telephone-receiver. Harry H. Hipwell, Allegheny, Pa.

662,010. Space-block for armature-cores. Edgar W. Mix and Elie Faure, Paris, France.

662,020 and 662,021. Method of rapidly transmitting telegrams. A. Pollak and J. Virag, Buda-Pesth, Austria-Hungary.

662,042. Dynamo-electric machine. Francis W. Thorp, Niagara Falls, N. Y.

662,048. Electric-arc lamp. James J. Wood, Fort Wayne, Ind.

662,049. Automatic circuit breaking apparatus. Granville T. Woods, Monsey, N. Y.

662,316. Magneto-electric machine. Frederick R. Simms, London, Eng.

662,376. Multiple-voltage controller. Gano S. Dunn, East Orange, N. J.

Business News.

NEW INCORPORATIONS.

Ithaca, N. Y.—W. K. Turner, D. M. Dean and H. Bergholtz have incorporated the Ithaca Electric Company for $50,000.

Maxatawny, Pa.—Kutztown and Philadelphia capitalists have recently incorporated the Keystone Light, Heat and Power Company for $15,000.

New Castle, Pa.—Capitalists of this city have incorporated the Lawrence Heat, Light and Power Company with $10,000 capital stock, and operations will be begun in the near future.

Newark, N. J.—William A. Jones, Edward D. Conklin and Frederick P. Crane have incorporated the American Light, Power and Transportation Company, with a capital stock of $1,000,000.

Jersey City, N. J.—The Equitable Light, Heat and Power Company has been incorporated under the laws of the State of New Jersey with a capital stock of $50,000, and expects soon to commence operations.

Junction City, Kas.—Local capital has incorporated the Junction City Electric Railway, Light and Ice Company with a capital stock of $100,000, to construct an electric railway from Junction City to Fort Reilly, and to operate an electric light plant in the former town.

TELEPHONE CALLS.

Philadelphia, Pa.—A branch line from North Wales, Pa., on the Allentown road, to Shimmersville is being strung by the Interstate Telephone Company of this city.

Indianapolis, Ind.—A 12-mile line in Clay County will be built by a new company of business men and farmers which has been organized in the town of Brazil.

Dayton, O.—The Progress Telephone Company has made application for a franchise, but so far has not met with much encouragement.

Kenton, O.—A new telephone line is being built in Goshen township for the convenience of the farmers of that section.

Caldwell, O.—The Caldwell Independent Telephone Company, with a capital stock of $5,000. has been incorporated by W. H. Bowron and others, all of Caldwell.

Cleveland, O.—An increase of capital stock has been certified to recently in this city by the United State Telephone Company. This brings the figures to a total of $2,000,000.

Mansfield, O.—The city council has granted a franchise to the Star Telephone Company. after a vigorous fight against the proposition. The city now has three distinct systems.

Shelbyville, Tenn.—The Citizens' Telephone Company has secured a charter and is preparing to begin

operations. The capital stock is $10,000, and is held by substantial citizens.

Conneaut, O.—The Conneaut Telephone Company has increased its capital stock from $30,000 to $50,000. Ed. L. Barber is president, and J. G. Palmer is the secretary.

Marion, Ind.—The Marion Telephone Company has been purchased by local capitalists, who will begin immediate extensions and improvements. Present estimates of the total cost of the proposed changes aggregate about $20,000.

Norwalk, O.—The Norwalk & Huron County Telephone Company has been incorporated with a capital stock of $80,000. R. P. Hull, W. H. Harper, Jr., Jas. King Duffy, H. O. Bentley, and A. M. Beatie, are the incorporators.

Albany, N. Y.—The Dutchess County Telephone Company, whose principal offices will be at Poughkeepsie, has been incorporated principally by New York capital for $125,000, and will operate throughout Dutchess and the counties in New York immediately adjoining.

Cincinnati, O.—The City and Suburban Telephone Association has decided to increase its capital stock from $2,500,000 to $4,000,000. The chief reason assigned for the increase is the further improvement of the plant and the acquisition of additional property.

Columbia, S. C.—A charter has been asked for by the South Carolina Telephone Company, which is capitalized at $500,000. The company will operate a telephone system between Columbia and Charlestown, extending it later on to other cities in the State.

ELECTRIC RAILWAYS.

Elyria, O.—Elyria financiers have in contemplation the construction of an electric line from Norwalk, eastward, through Berlin and Florence, to connect with the Cleveland, Elyria & Western.

Findlay, O.—Manager Charles Smith, of the Findlay Street Railway, announces that his company will extend its line north from Mortimer, the present terminus, to North Baltimore, a distance of five miles.

Boston, Mass.—Local capital has recently incorporated the Electric Safety Traction Company with a capital stock of $5,000,000, its object being to build and equip electric railways in the State of Massachusetts.

Concord, Mass.—Boston capitalists are said to be heavily interested in the Concord & Clinton Street Railway Company, which has recently been incorporated for $60,000. The line will start in Maynard and run six and one-half miles through Acton into Concord.

Cincinnati, O.—The Cincinnati, Lawrenceburg & Aurora Electric Street Railway Company is now putting in service four new 50-horse-power motor cars. With these additions they expect to lessen their schedule time between principal points very materially.

Montpelier, Vt.—A charter has been granted to the Chittenden County Traction Company, which has been incorporated with a capital stock of $200,000. The company's purpose is the construction of an electric railway from Colchester, through six intermediate towns, to Addison.

Toledo, O.—The president of the Toledo, Ohio, Fremont & Norwalk Electric Railway states that work on the Genoa-Marblehead electric line will be commenced as soon as the main line is completed to Norwalk. The extension to Tiffin will be commenced about the same time.

Concord, N. H.—A charter has been granted to the Exeter, Portsmouth & Newmarket Street Railway Company, which was incorporated recently in this city with a capital stock of $100,000, to operate a line which will be twenty miles long. The capital involved is principally from Massachusetts.

Guadalajara, Mex.—An unconfirmed report to a New York daily paper states that the street railway system of Guadalajara has been sold to an American syndicate whose capital is mostly from Pittsburgh, Pa. It is further stated that the new owners purpose to equip the entire system for electric traction, and bonds to a large amount will be floated for that purpose, the General Electric Company being reported to have the contract.

Columbus, O.—The Columbus, London & Springfield Electric Railway Company has increased its capital stock from $1,000,000 to $1,500,000. J. S. Harshman is the president and the Hon. Emmet Tompkins is the secretary. A copy of the $1,500,000 mortgage given by them to the Continental Trust Company has also been filed with the city clerk. The company hopes to have the line in operation by the holidays in order to get its patrons into Columbus for their Christmas shopping.

CORPORATION CHANGES.

Albany, N. Y.—Certificates have been filed by the Queens Borough Electric Light and Power Company for an increase of its capital stock to $410,000.

Hartford, Conn.—Certificates filed in the office of the Secretary of State show an increase of $3,500 to the capital stock of the Hartford Electric Light Company, which was incorporated for $700,000.

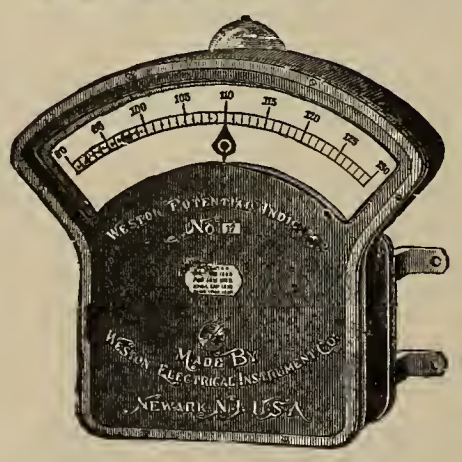
Peekskill, N. Y.—A $750,000 mortgage was recently filed in the office of the Register of Westchester County, N. Y., by the Peekskill Lighting and Railroad Company, the money being desired to extend the company's lines in Connecticut and the northern part of Westchester County. The mortgage is in favor of the New York Security and Trust Company and is signed by the president and treasurer of the Peekskill corporation. If the company's plans are successful another extension will be made soon from Peekskill to Sing Sing, where connections will be made with the Ossining trolley road.

POSSIBLE INSTALLATIONS.

Tampa, Fla.—A vote will be taken in Tampa, on December 18, to decide upon the question of issuing $25,000 in bonds to provide for the purchase or construction of an electric light plant.

Kasson, Minn.—The electric lighting plant was entirely destroyed by fire recently, and the village authorities have determined to rebuild it in a more modern manner, and on a somewhat larger scale than before.

WESTON STANDARD ILLUMINATED DIAL



STATION INSTRUMENTS.

THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

114-120 William St., Newark, N. J., U. S. A.

BERLIN. European Weston Electrical Instrument Co., Ritterstrasse No. 89.
LONDON. Elliott Brothers, No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI.—No. 23. NEW YORK, DECEMBER 8 1900. Whole No. 708.

Portable Electric Generating Plants.



Modern Type of Traveling Electric Light Plant.

ELECTRIC LIGHT PLANTS ON WHEELS.

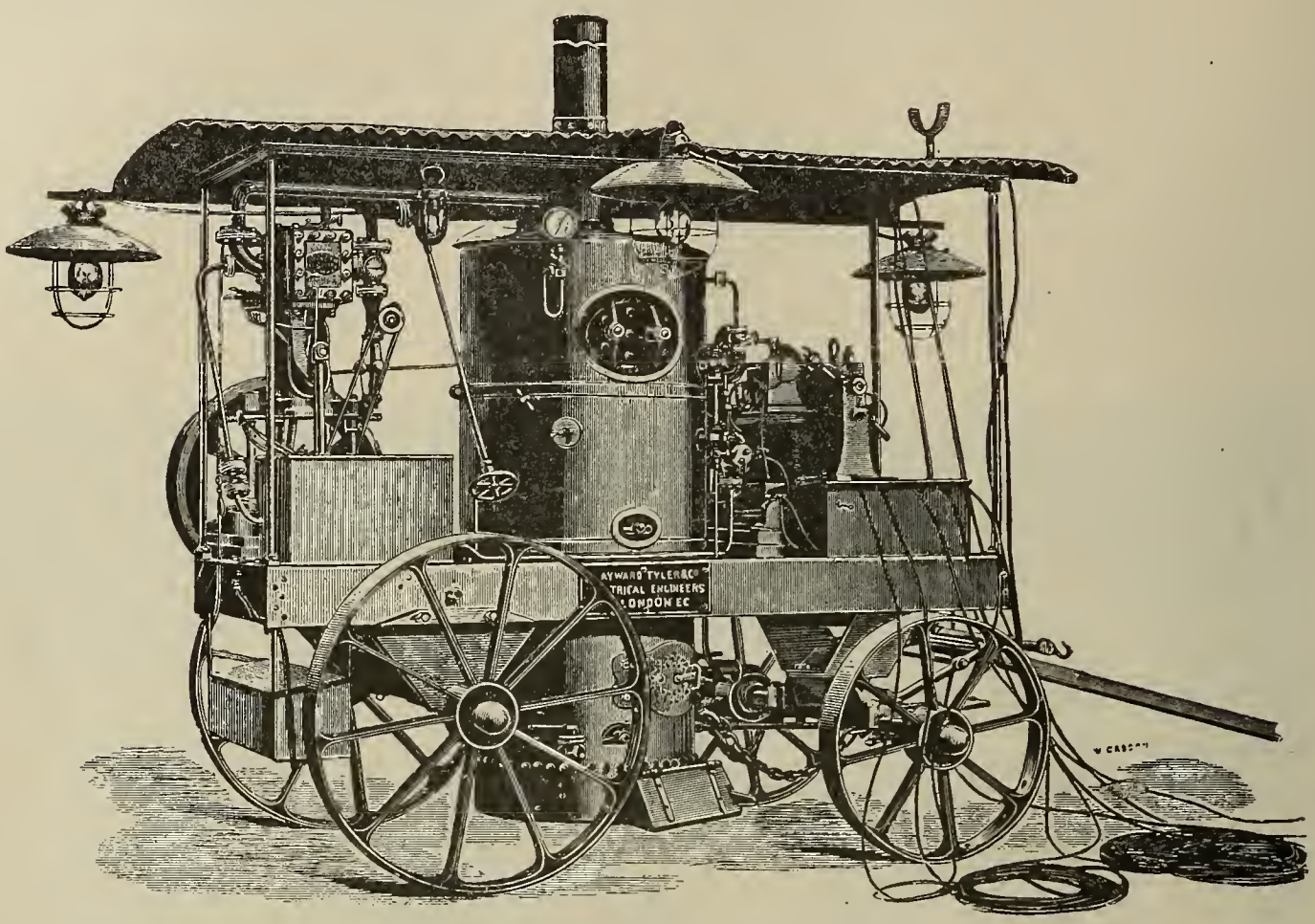
In the illustrations are shown two types of electric light plants which move from place to place at the owner's option. One sketch is illustrative of the early stages of the art, in comparison with a more recently designed plant now employed by "Buffalo Bill' in his "Wild West" show. While this notes a curious departure in electric lighting it is nevertheless a useful one in many ways. First, for providing light in an emergency; second, for providing power for storage. The increasing use of automobiles has made it likely that traveling electric light plants of this character may have many opportunities of supplying electricity in case of break-down or of making repairs. In either case the novelty is not less strange in itself and the purposes to which this apparatus may be put. The only suggestion that lies open in connection with this unique departure is that the moving electric light plant can very readily be self-driving: in fact, it should be an automobile or autotruck with enough surplus power to supply the needs of others of its kind or perform such other functions as necessity may call for.

The New Britain Machine Company supplied the generating plants in the modern type shown.

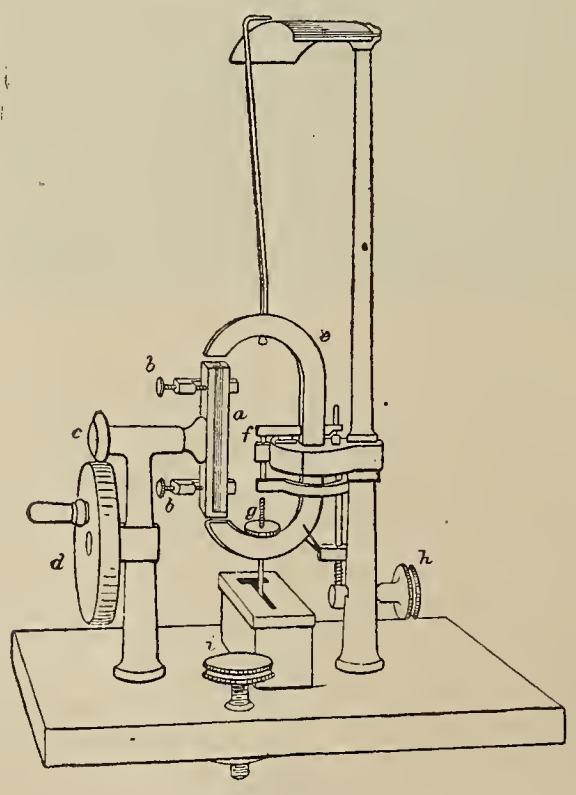
Technical Notes.

HYSTERESIS IN TRANSFORMER CONSTRUCTION.

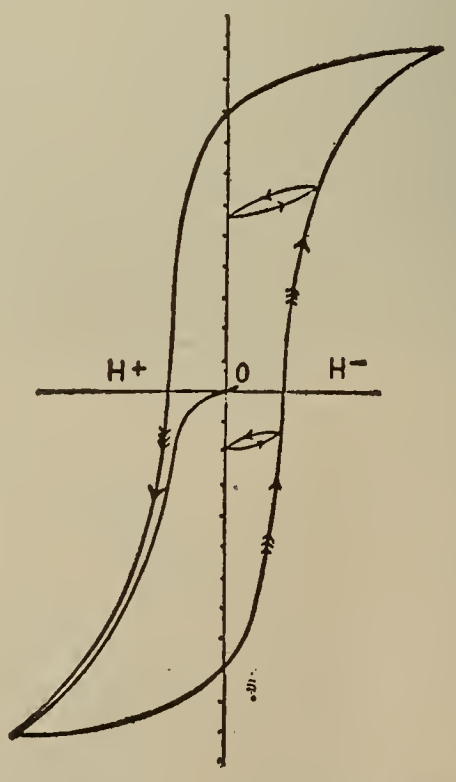
Some of the transformers giving high maximum efficiencies do not give the highest all-day efficiencies and in such cases tests would tend to indicate that an increase in the number of turns and a decrease in the iron and magnetic density would be of advantage. The iron losses are so variable that a comparison can be made through tables of the losses per cubic centimetre. As the magnetic densities in various transformers are different these tables do not give directly the relative qualities of the iron. Hence, a column of hysteresis constants would be necessary. These constants are calculated from the formula of Steinmetz $U = v V^{1.6}$, the last symbol B being raised to the 1.6 power. In this formula U is energy in watts lost per cubic inch or per cubic centimetre of iron; V is the frequency; B is the maximum induction per square centimetre and v is a constant of hysteresis which depends upon the quality of the iron. In calculating the hysteresis constants the core losses may be considered to be entirely due to hysteresis which does not introduce a large error, as the foucauld current loss is only a small portion of the total loss. As the iron losses are the most important factor in determining the all-day efficiency too much stress cannot be laid upon this point. The great difference in the quality of iron used in different transformers makes it necessary to test each batch of iron before it is made up into transformer cores.—Extract from "Alternating Currents."



Old Style of Portable Electric Light Plant.



Hysteresis Curve.

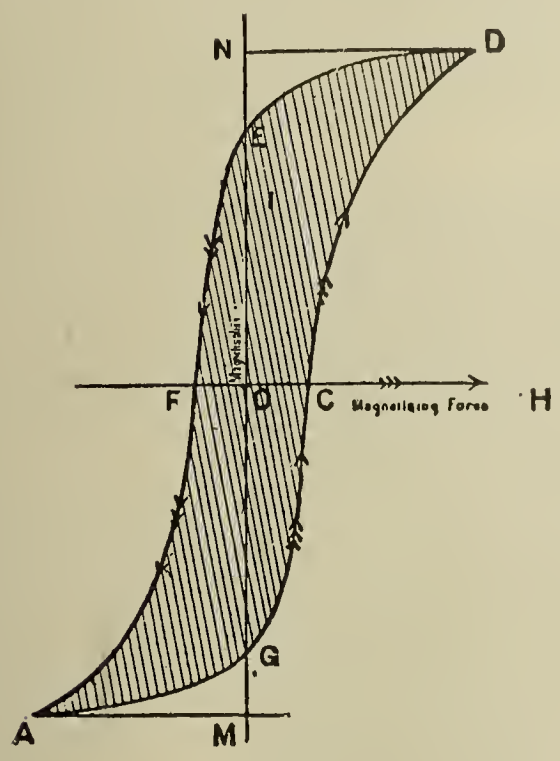


Machine for Testing Hysteresis.

Novel Applications of Electricity.

ELECTRIC DRILLS IN PRACTICAL OPERATION.

Until a short time ago two types of drills held the field, the hand drill and the direct acting or steam or air drill. With the extension of electrical methods of power transmission to mining operations came the urgent demand for an electrically operated drill. In particular the electric percussion drill is now most required.



Hysterecis Loss in Transmission.

The general requirements of an electric percussion drill for mining work are that it shall be light enough to be quickly handled by two or three men; it must be powerful enough to compete with an air drill that absorbs eight or ten horse power; it must be so simple in its design that it can readily be repaired by an ordinary mechanic without electrical experience; it must be so



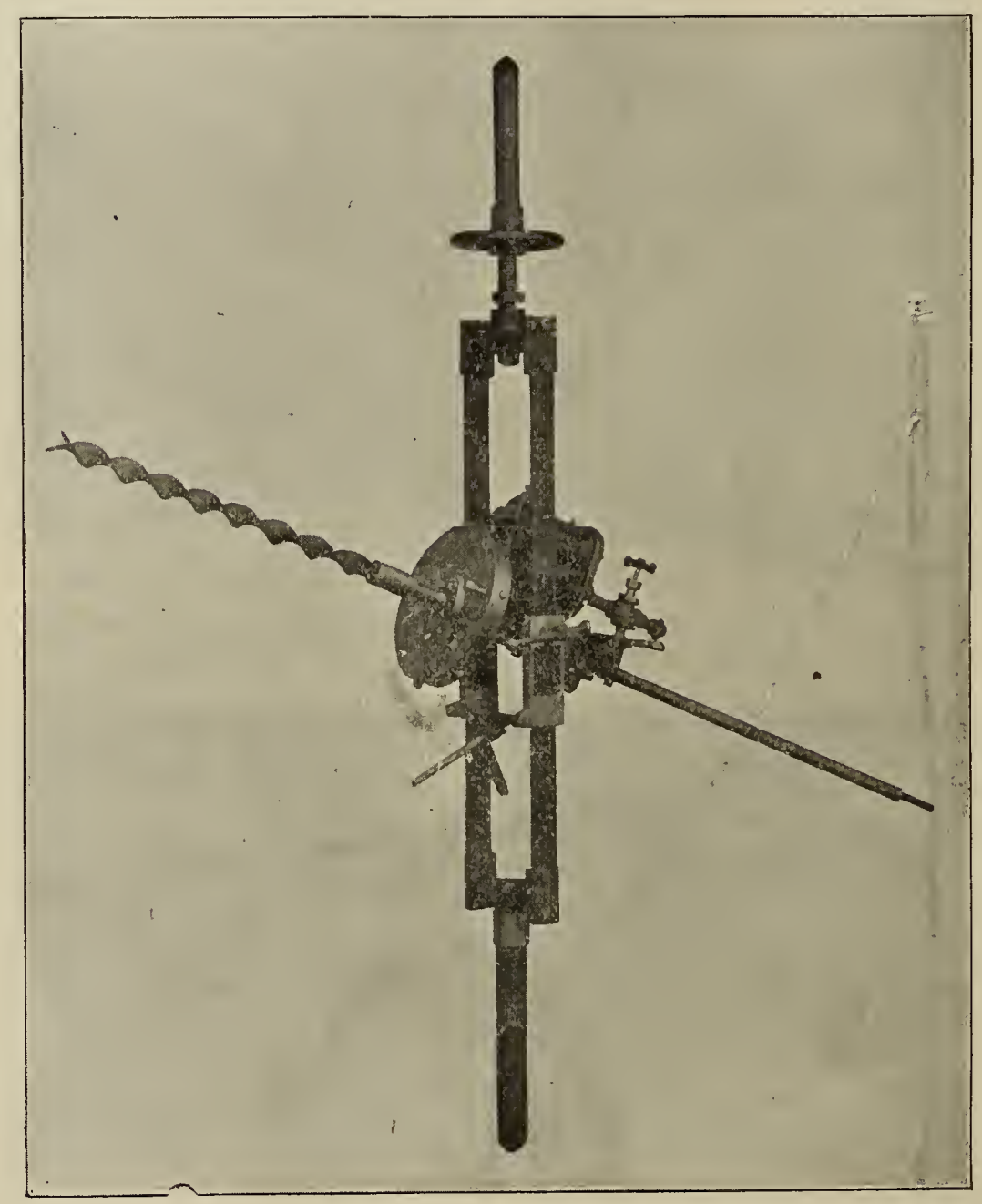
Cutting Stone with an Electric Drill.



Electric Drill for Cutting Coal Installed in Mine.

constructed that the complete machine and its several parts can be soaked in mud and water without injury; it should be incapable of burning out; it must be able to endure almost any amount of the roughest handling without injury and the materials employed should be as little subject to crystallization as possible. In part these suggestions form parts of the electric drill such as those illustrated.

For the benefit of those unfamiliar with the action of the air drill it may be stated that the general practise at present is to give the machine a stroke of from five to seven inches, to strike as nearly as possible an uncushioned blow upon the rock and to make as many blows per minute as the power applied will develop, usually



Electric Coal Cutting Drill.

from two to four hundred. The drills shown in illustration are of two kinds: the first and larger for boring coal seams; the second for stone cutting of an ornamental nature. In both cases the advantage and efficiency of the drills has proven their superiority over the older types.

Miscellaneous.

PRODUCTION OF WHITE LEAD BY ELECTRICITY.

A new method of producing white lead and other metallic compounds has been invented by E. Bailey. The invention relates to means of producing white lead direct from pig lead by the use of the electric arc. The lead to be treated is kept in a molten state, and as all the apparatus is practically hermetically sealed the process is free from any danger to the operator. The metal to be volatilized by the electric arc during this action is acted on by gaseous vapors which produce carbonate of lead or any other required lead compound. The fumes produced are blown into chambers having canvas or fine fabric cloth covers or roofs. The fine dry powdered white lead falls down and the uncondensible gases pass through the fine canvas roof, thus dispensing with grinding, washing, drying, and many other objectionable processes in connection with the present white lead industry.

There is a saving both in time and material in this process, and there would be more where there is a destructor at work to utilize the waste gaseous compounds given off during the combustion of the refuse. The main cost of the production entirely depends upon the cost of fuel or electric motive power and the facility of getting cheap pig lead at low rates of transit. But even under the same conditions as other white lead manufacturers it is claimed that there will be a saving of 50 per cent. in production by this rapid and direct process.—Ex.

The French War Department has appropriated $80,000 for secret experiments on wireless telegraphy with a view to perfecting its applications in war.

The Electrical Age.

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NEWTON HARRISON, E. E. Editor.

Walter Mueller, Managing Editor.

ASSOCIATE EDITORS.

Electric Light and Power.

Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.

Electro-Therapeutics.

Joseph Muir, M. D.
Frederick Strange Kolle, M. D.

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ARE ELECTRICIANS FIREBUGS?

We are beginning to seriously believe that electrical constructors have exhibited martyr-like qualities, as far as patience and long suffering are concerned. Whenever a fire of any consequence occurs it is generally traced to electric wires. It seems as though the blame has been laid on the contractor so frequently that he has become indifferent to complaints. There is such a thing in physiology as causing pain, which after reaching the maximum deadens the sensibilities and a merciful numbness spreads over the tissues. This in some respects represents the position of the electrical contractor with regard to wiring installations.

It has been shown repeatedly that modern methods of wiring are particularly safe in comparison with what was once installed; that the risks from fire are so reduced where iron conduit is used that it might be regarded as an impossibility. Yet in spite of these generally admitted facts the recent fire in Brooklyn, like the fire at Tarrant's drug store, was supposed to be due to electric wires. This popular superstition has been spreading of late and someone ought to take a stand and call to account those who make statements of this kind without proof. If electricity when used for lighting is so dangerous it would seem as though the fire underwriters ought to enforce more rigid laws and the fire department can have its say as well; but why should the old cry be heard so frequently? It is not only monotonous but false and if false it should be suppressed.

TEMPERATURE AND INSULATION.

The idea of insulation is purely a relative one. A piece of glass is a non-conductor; a copper wire a good conductor. Yet both are, in a sense, one, because neither conductor nor non-conductor differ so essentially from each other, except in a relative manner, that we can consider them as distinctly different. Insulation tests of glass may show that it possesses a resistance of millions of ohms while copper is almost infinitessimally low in comparison. Yet under certain influences glass becomes conductive to a perceptible degree and copper non-conductive. In experiments tried some years ago by a well known electrical engineer the cores of carbons were made of glass, the conducting power of the vapor being found beneficial in producing light.

It has been shown experimentally (in the test of the alternative path) that a current of an oscillatory character of very high frequency cannot penetrate a copper wire. A discharge from Leyden jars under certain conditions will jump an air gap in preference to passing through a copper conductor. On the other hand, the resistance of insulators may be greatly reduced by heat. Nature might have transformed carbon into a material of much greater resistance had the heat and pressure in primeval ages been a little greater. As it was, diamonds were formed, the crystallized carbon of which has a comparatively high resistance. Under the influence of heat glass and a variety of insulating materials, such as porcelain, china, etc., and carbon as well, lose their resistance rapidly and become comparatively good conductors. This phenomenon is plainly in evidence in the incandescent lamp. Here the carbon may have four or five hundred ohms resistance when cold, yet while reaching a point of incandescence its resistance diminishes until when incandescent it is reduced more than fifty per cent.

A perfect vacuum would be an absolute insulator, according to theory, yet the practical difficulties in the way of obtaining a degree of exhaustion of this character are such as to almost remove even the hope of accomplishing it. However rarified a medium may be, to whatever extent the exhaustion may be forced, millions of particles of air and other gases are still in existence in the apparent vacuum and any transfer of electricity taking place is through their agency. In all probability strange phenomena would appear in an absolute vacuum and certain scientific conclusions must be drawn in such a case of the utmost importance in connection with X-ray investigations.

The opinions of Lord Kelvin, Faraday, Lenard, Crookes, Tesla and others, in regard to the condition of matter while in a comparative vacuum, have been freely discussed in the technical journals in the past few years though no conclusions of practical importance have been drawn during that period. Aside from this, however, the non-conductibility of an absolute vacuum is unquestioned although influences may be transmitted through it that show a constituency there that almost resembles that of more familiar forms of matter. The influence of heat upon a vacuum of this description might, in the light of our past experimental data, lead to the conclusion that some form of conduction would then take place with respect to electricity. If this were so a better knowledge of the molecular actions required to conduct heat and electricity would be possible. At present certain questions remain unanswered in magnetism as well as electricity; the permanence of magnetism in a steel bar or the exact nature and cause of the increase of magnetism in a wrought iron bar.

PRACTICAL ELECTRICITY FOR EVERYBODY.

SPECIALLY PREPARED FOR STUDENTS AND ELECTRICIANS.

ELECTRO-MAGNETISM.

A magnetic field is the space in which magnetic force appears. It has often occurred that a given effect is the result of apparently different causes. In the case at hand attention is to be drawn to the principal means by which magnetism is produced.

(1) Due to natural causes—the lodestone.

(2) Due to contact—the steel magnet.

(3) Due to the electric current—a wire carrying a current.

A coil of wire carrying a current will be found to possess magnetic qualities and has, by investigation with a compass, both a north and a south pole.

The strength of the current will have an effect upon the magnetic field the coil produces, as likewise, upon the iron in its centre.

A wire in which a current passes becomes magnetic on the outside to such an extent that a delicate compass is at once affected when brought near.

The strength of the field produced by a coil of wire depends upon

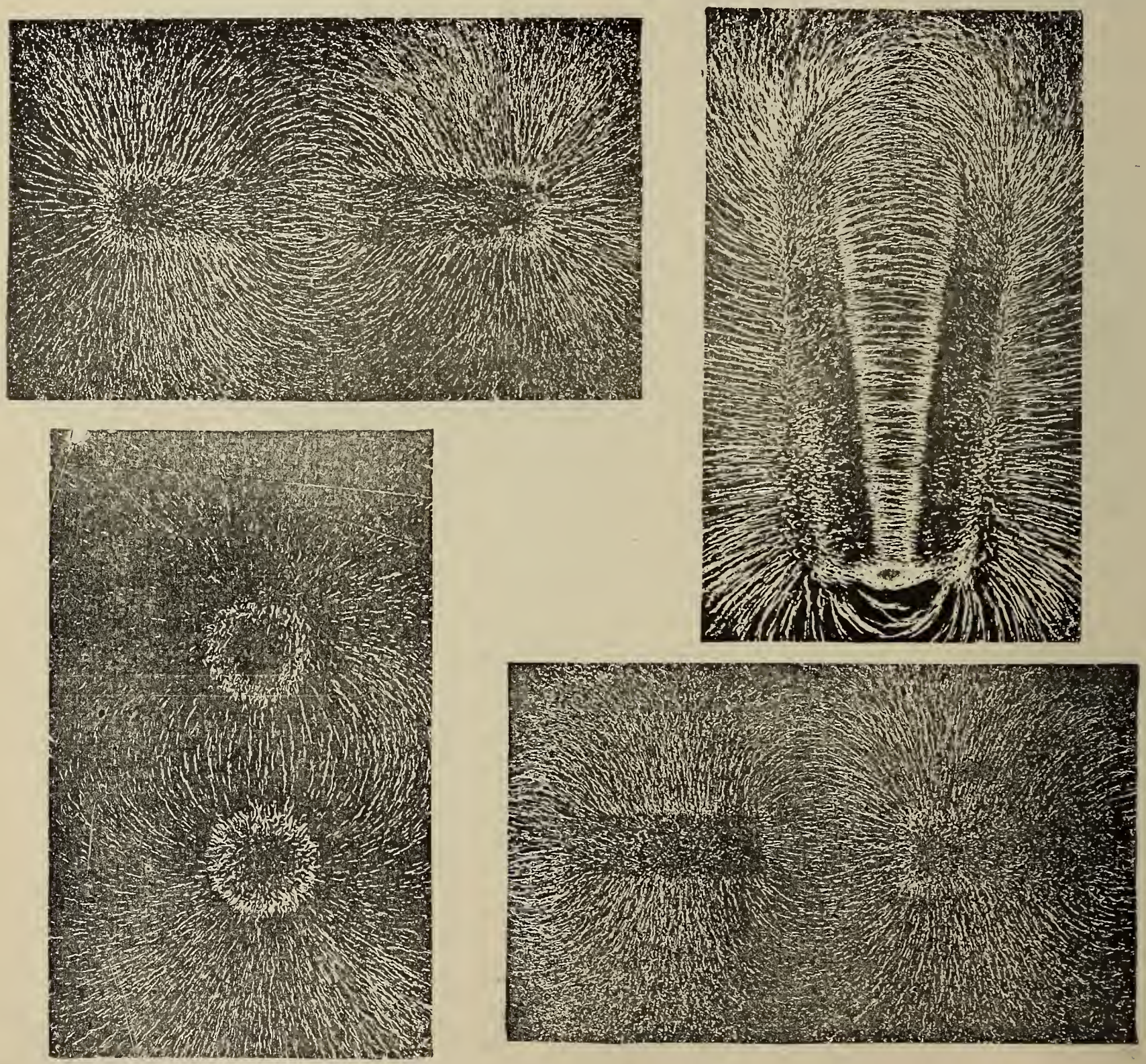
The strength of the current.

The number of turns.

By coiling the wire all the magnetic energy is concentrated at the centre, and therefore manifests itself there most strongly.

The whirl of magnetic energy around the wire disappears when the current ceases, increases in intensity as its strength increases, and acts in perfect accord with it.

Iron placed in the coil makes it a powerful magnet,



Cuts Showing Attraction and Repulsion of Magnetic Poles.

because the number of lines of force have been increased by it, and likewise the usefulness of the coil.

Permeability.—Different materials affect these lines of force when passing through them to various degrees.

Iron increases them.

Nickel increases them.

Copper or air leaves them as before; acting alike.

It seems that iron conducts them, as it were, easier

than aything else we know of; but air treats them with indifference, the number neither increasing nor diminishing with or without a vacuum.

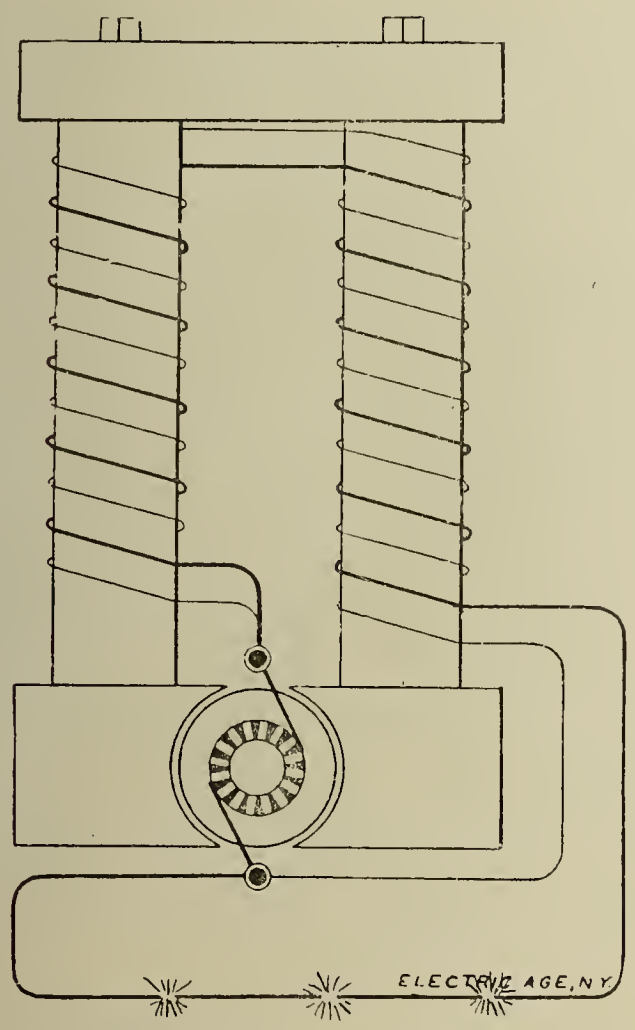
This property of a body to carry the lines of magnetic force is measured by their permeability. The standard taken is—

Air = 1, a fixed value.
Steel = 800, a variable value.
Soft iron = 1000, a variable value.

The multiplying effect of soft iron in a coil is so great that its strength has been raised on occasions to a point where 200 pounds pressure per square inch was produced.

The greater the permeability of the iron, the better it is for the building of dynamos.

Wrought iron is best;
then follows Mild steel, and
Cast iron,



Application of Electro-Magnetic Principles to a Dynamo.

arranged according to their permeability.

The strength of the magnets, or rather of the iron within the coil, is measured by the number of lines of force it possesses to the square inch.

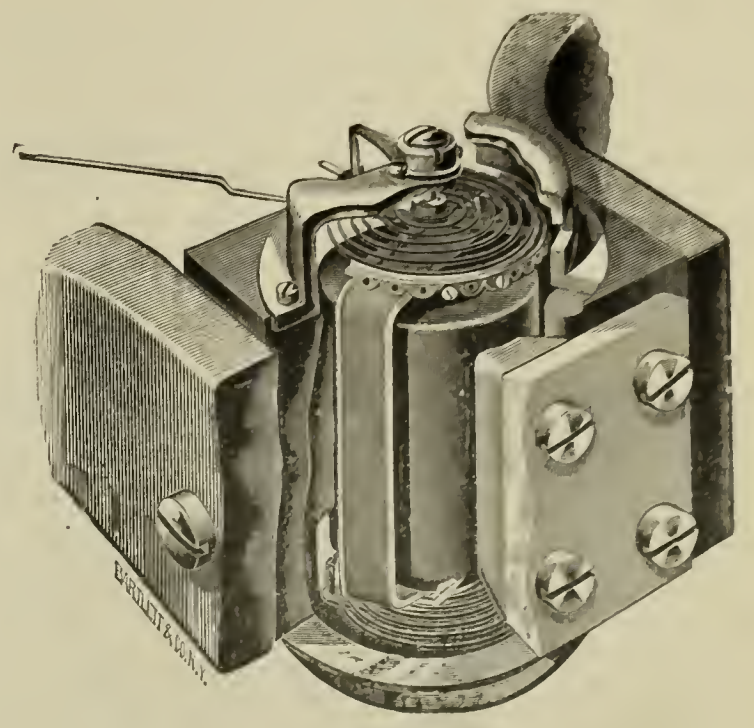
Approximately, Wrought iron takes 100,000.
Mild steel takes 80,000.
Cast iron takes 60,000.

Saturation.—When the iron is carrying as many lines of force as possible it is said to be saturated, in the same sense that water in which sugar is being dissolved will ultimately refuse to carry any more in solution. Actually this stage is never reached, but a condition bordering upon it is such, that enormous power is required to gain a slight increase in lines of force. It is economical in the manufacture of dynamos to keep well within this limit.

A north pole in a coil can be known without testing, because it is merely necessary to discover whether in the end of the coil facing you the current is circulating in a direction opposite to the hands of a clock.

A south pole in a coil is known if the current in that end of the coil circulates with the direction of the hands of a clock.

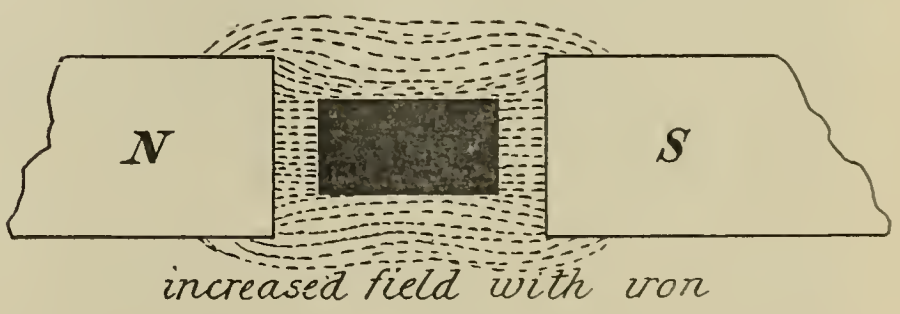
The number of lines of force a piece of iron produces



Application of Electro-Magnetism to a Measuring Instrument.

with a coil grow very rapidly up to a certain point; then the increase becomes less and less, until ultimately saturation results.

The curve of saturation shows this very clearly; that is, the rapid increase of lines of force due to the turns and current. With a few turns and little current the



number of lines of force grow rapidly within the iron; up to a certain point this continues, but even though the magnetizing force be doubled or tripled the lines of force increase but slowly.

Ampere turns is the name given to turns carrying a current. One turn carrying a unit of current (an ampere) is called an ampere turn.

The ampere turns acting in 1000 turns carrying $^1/_{10}$ of an ampere equals

$$100 \times {}^1/_{10} = 100 \text{ ampere turns.}$$

The same magnetizing force would be produced by 100 turns and one ampere, or 200 turns and half an ampere, etc.

Turns and amperes are multiplied together to give ampere turns.

Magneto-motive force is the name given to the magnetic force derived from the ampere turns which excites lines of force in air, iron, steel, etc., in quantities de-

pending upon the

Cross section,
Length,
Permeability of the same.

The magneto-motive force = 1.257 x the ampere turns.

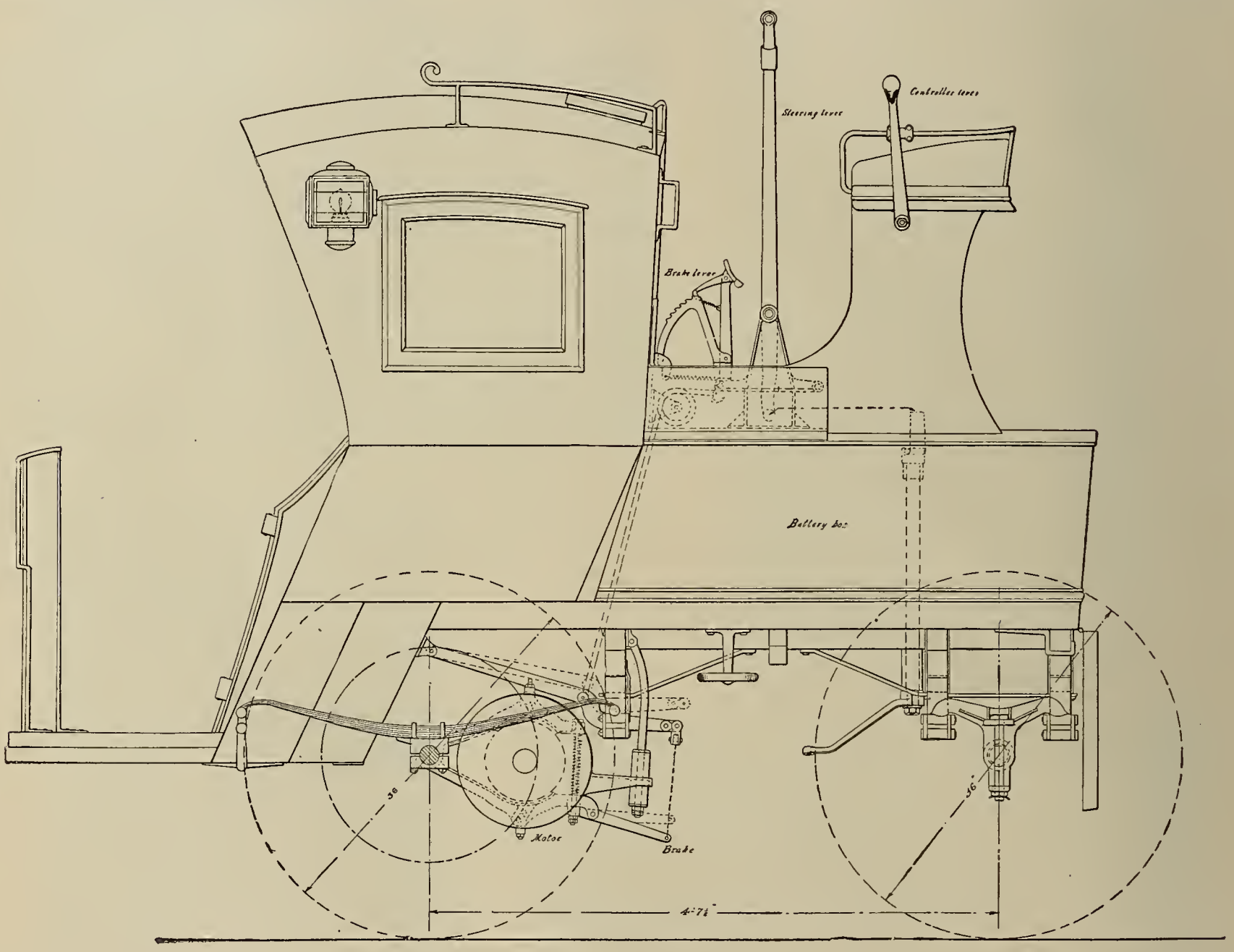
In any material the number of lines of force are found by the following rule:

Lines of force =
Magneto-motive force x permeability x cross-section.

Length.

This rule as it stands is applicable at once, if the length and cross-section are given in the metric system; that is, in centimeters and square centimeters; otherwise it must be modified for English measure.

quite generally understood. Mechanically speaking, it is almost simplicity itself. A running gear, with a motor or two motors geared by single reduction to the rear axle or wheels; a controller; at the most a differential glar—there is hardly machinery enough to claim the title. The rest is battery; but in importance this is nine-tenths of the whole. The electric carriage, as usually equipped, cannot go more than ten or fifteen miles from a charging station, if the roads be good, or much less if they be bad. It can be forced, by hill climbing or high speed, to double or treble its normal power; but forced discharges mean rapid and costly disintegration of the plate. Too rapid charging has the same effect, and it is impracticable to charge and discharge the battery more than twice per day. Frequent starting and stopping



Cross Section of an Electric Cab.

The Automobile.

THE CHOICE OF SYSTEMS.

The first question of the layman, perplexed by the apparently conflicting claims of the electric, steam and gasoline carriage builders, is usually, "Which motive system is really the best?" says Herbert L. Towle, in "The Automobile." This, however, is much like asking which is the best breed of horse; for the answer will depend in large measure on what the vehicle is to be used for, and to some degree also on the personal equation of the user.

The character and scope of the electric vehicle are now drains the stored energy very quickly, and rough roads compel frequent repairs. Every day or two, if the carriage is in constant use, the battery must be tested, cell by cell, to see that each delivers its full voltage and that the acid solution is of the proper density.

In a word, the electric carriage is suited only for local use in cities and their immediate suburbs,where it is never called upon to do hard work. On the other hand, its ideal simplicity as regards management, its absolute safety, and its freedom from objectionable noise and vibration, make it the urban pleasure vehicle par excellence. It costs more to run than the gasoline or steam vehicles, and battery repairs, when necessary, are not cheap, but on asphalted pavement neither of these drawbacks can be called important.

Among the Societies.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

At the 148th meeting of the Institute held at New York and Chicago, Nov. 23d, a paper was presented by Mr. B. A. Behrend, of Erie, Pa., "On the Mechanical Forces in Dynamos Caused by Magnetic Attraction." The author exhibited a few lantern slides of the machines from which the data in his paper was derived, also a very excellent portrait of Helmholtz.

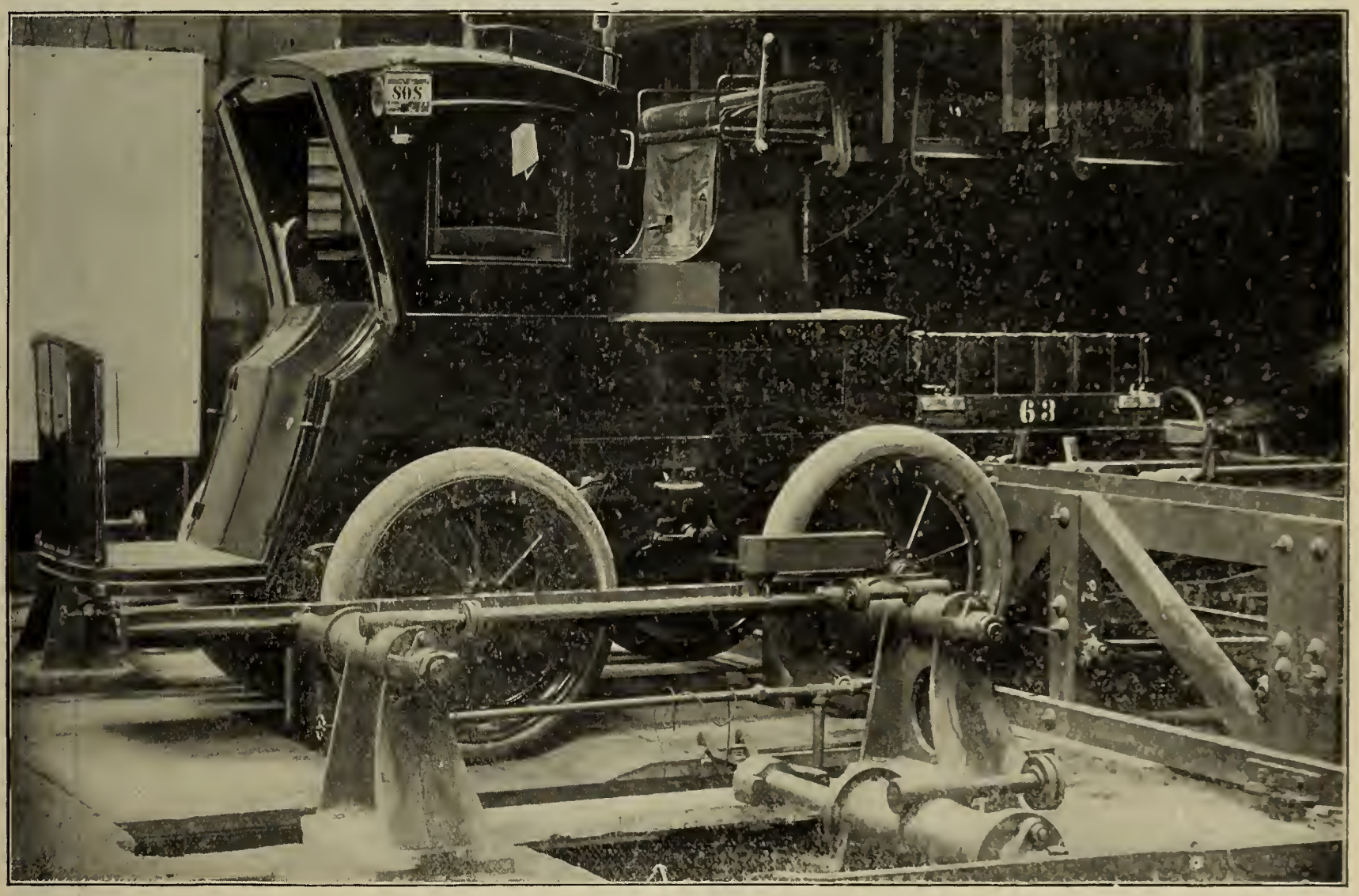
A paper was also presented by Mr. Henry Floy, of New York city, on "The Plant of the St. Croix Power Company of Wisconsin." The papers were discussed at New York by Messrs. Behrend, Billberg, Dunn, Henshaw, Hering, Mailloux, Pope, Rice, Sheldon, Thompson, Wheeler and Wolcott.

At the meeting of the executive committee in the afternoon the following associate members were elected: George Porter Baldwin, Warren James Ballou, V. G. Converse, Mikail Andrejevitch de Chatelain, Edward Andrew Deeds, George Hafer, Jr., James Cezanne Kelsey, Harry Russell Leyden, Christopher Meyer Lowther, George Henry Sethman, Frank W. Springen, Philip Kossuth Stern, Nathaniel Marion Snyder, George Alexander Walkem, Leon Byron Woodworth.

The following associate members were transferred to membership: W. A. Layman, Ferd. Schwedtmann and Louis J. B. Wall.

NEW YORK ELECTRICAL SOCIETY—210TH MEETING.

The 210th meeting of the society will be held at the College of the City of New York, 23d street and Lexington avenue, on Wednesday, December 12, at 8 P. M. Dr. Samuel Sheldon will lecture on "Electrical Measurements of Precision." The lecture will include: 1. Recent improvements of methods for electrical measurements of precision. 2. Distinction between commercial measurements and those of precision. 3. Distinction between absolute measurements and those of comparison. 4. Present standards. 5. Methods of comparing standard resistances of all magnitudes. 6. Methods of comparing E. M. F.'s. 7. Current measurements. 8. Standard luminants and their comparison. The following standards will be exhibited: 1 ohm, 0.01 ohm, Reichsanstalt Clark cell, Carhart cell, Reichsanstalt compensation set, Heiner-Alteneck lamp, Improved Lummer-Brodhun photometer screen. After Dr. Sheldon's lecture some remarks will be made by the president on "Lighting at the Paris Exposition," with some night views.



Electric Automobile being Charged.

PAPERS TO BE READ AT THE MEETING OF THE ROENTGEN SOCIETY OF THE UNITED STATES, NEW YORK, DEC. 13-14, 1900.

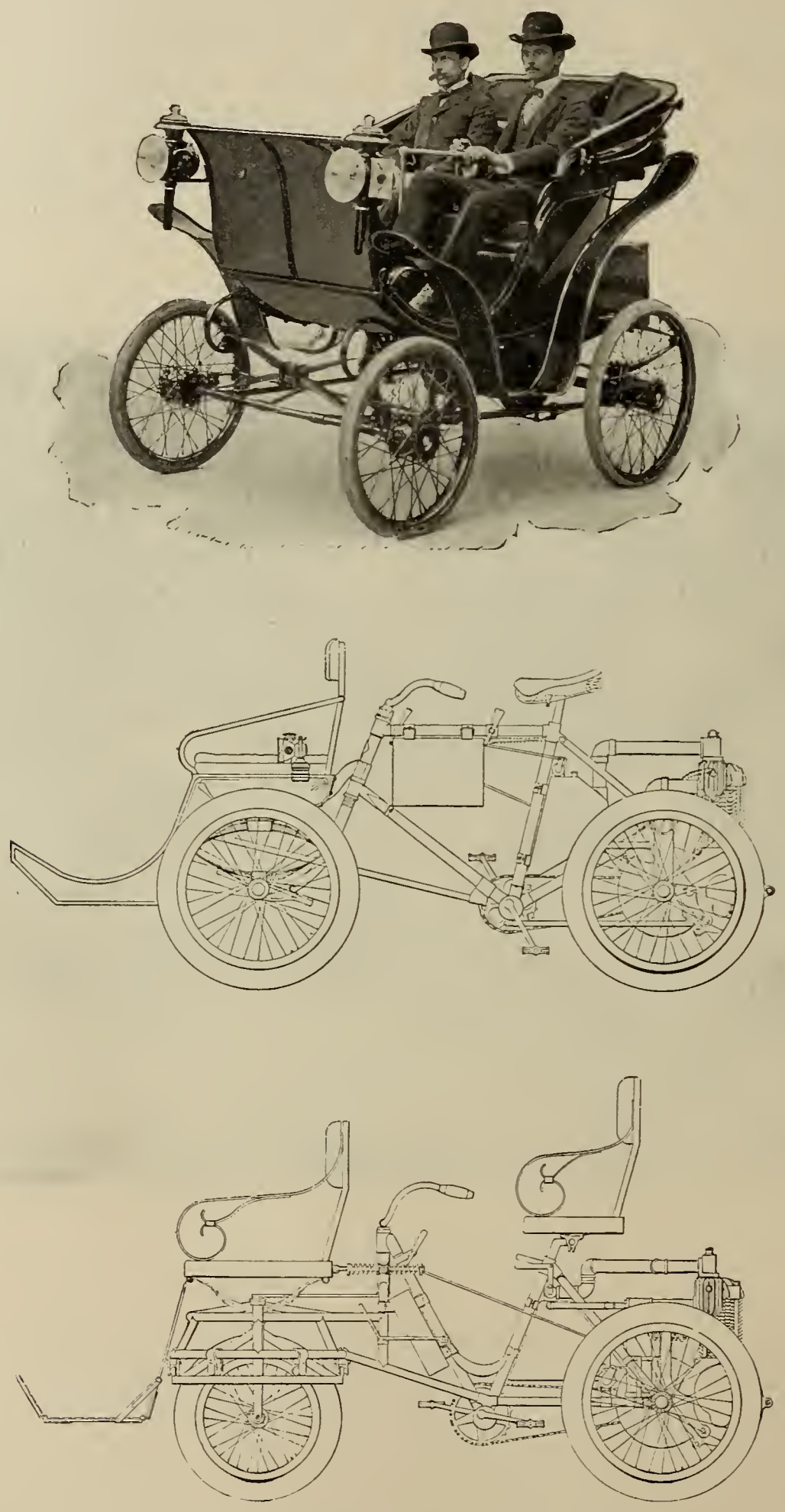
Thursday, December 13th, 2 P. M.—The Development of the X-Ray Plate, Dr. J. N. Scott, Kansas City, Mo.

Application of Roentgen Rays to Dentistry, Dr. C. Edmund Kells, Jr., New Orleans, La.

The First Legal Victory of the X-Rays Shadow as Seen by the Iowa Jury, Illustrated, Dr. F. Wesley Sells, Murray, Ia.

sarcoma by the Roentgen Rays, Dr. Carl Beck, New York city.

Thursday, December 13th, 8 P. M.—The Monell-Position Finder for Centering Skiagrams, Dr. S. H. Monell, New York city.



Two Systems of Automobile Propulsion.—The Electrical and the lower ones the Gasolene System.

A Review of Cases of X-Ray "Burns," Dr. E. A. Florentine, Saginaw, Mich.

X-Light Apparatus for Physicians in the Country, Dr. William Rollins, Boston, Mass.

On Diagnosticating Ostitis, Osteomyelitis and Osteo-Skiagraphy in Oral and Dental Surgery, Illustrated, Weston A. Price, D. D. S. M. E., Cleveland, O.

Practical Work with the Static Machine and Vacuum Tube, Dr. J. M. G. Beard, Fruita, Colo.

X-Ray in Lupus Vulgaris, M. U. Dr. Jos. Hoffmann,

Vienna, Austria.

The Electrochemic Action of the X-Ray in Tuberculosis, Dr. J. Rudis-Jicinsky, Cedar Rapids, Ia.

Demonstration of the Mount Bleyer Electro-Arc Chromolinne for the Treatment of Tuberculosis by Colored Light Rays, Dr. J. Mount Bleyer, New York city.

Indications for General Franklinization, Report, Prof. A. Tripier, M. D., Paris, France.

Friday, December 14th, 10 A. M.—How to Print the X-Ray Picture for Details, Dr. John T. Pitkin, Buffalo, N. Y.

Standard Pictures in Skiagraphy and How They May Be Secured, Dr. L. A. Weigel, Rochester, N. Y.

The Monell X-Ray Standardizing Gauge and Fluoroscope Test, Dr. S. H. Monell, New York city.

The Technique of the X-Ray Work, Dr. Mihran K. Kassabian, Philadelphia, Pa.

Stereoscopic Skiagraphy, Dr. L. A. Weigel, Rochester, N. Y.

General Observations on Crook's Tubes, H. Westbury, Harrison, N. J.

Amplifying and Parallelizing X-Rays, Prof. Elmer Gates, Chevy Chase, Md.

Friday, December 14th, 2 P. M.—Stereoskiagraphy, Dr. G. P. Girdwood, Montreal, Canada.

Demonstration of Skiagraphs of Injuries at the Elbow Joint, at Time of Injury and the Gradual Repair of Same, Successive Skiagraphs, Dr. A. H. Schwab, Brooklyn, N. Y.

Technique of Skiagraphy, W. C. Fuchs, Chicago, Ill.

A Demonstration of Electrolitic Interrupters, E. W. Caldwell, New York city.

The Monell Distortion Landmark for X-Ray Negatives, Dr. S. H. Monell, New York city.

AN ELECTRIC LIGHT STATION WORKED BY NATURAL GAS.

At Bradford, Pa., there are four gas engines of 125 horse-power, and one of 200 horse-power, all of the Westinghouse type. Two of the 125 horse-power engines drive each two Thomson-Houston arc lighting dynamos, each dynamo generating current for 51 arc lamps. The two dynamos are driven by two belts taken from opposite pulleys of the engines. The engines are stated to consume only 13 cubic feet of the natural gas per hour, as against 54 cubic feet per hour consumed when the gas was used to heat boilers which were raising steam for the same purpose—a striking instance, if substantiated, of the economy of direct consumption of the fuel in the cylinder of the engine, instead of under a boiler. A triple pump is used to keep the water circulating around the cylinders of the gas engines, and an air-compressing plant is used for starting the engines. The cost of fuel is stated to be $1.12 cents for one engine working 102 arc lamps for eight hours. This is enough to make even the most economical of our central-station electrical engineers green with envy.—Ex.

STILL ANOTHER.

The defective insulation bogey has been at work again. This time his operation were confined to the Ridgewood power house of the Brooklyn Rapid Transit Company, which was destroyed by fire on Tuesday, December 4. "The fire is believed to have been the result of bad insulation" is the verdict. How the carelessly thrown match and the cigarette, glimmering away merrily in some obscure corner, must feel to have not even received an "honorable mention."

SUGAR COATING THE TROLLEY.

The Larchmont, N. Y., Railway Company will abandon its old horse cars, which have been running for ten years, and put electric cars in their places. The inhabitants of Larchmont have had such a deep prejudice against the trolley that President Charles Singer, in order to propitiate them, has bought the most expensive cars in the market for use in the Manor section, which extends from the New Haven Railroad to the Sound, a distance of about a mile. The new cars are the finest ever seen in Westchester County. Each car is vestibuled and all the railings are of polished brass and nickel. The cushions are six inches tick and an electric push button is placed at each window, so that the passenger can stop the care without calling the conductor. Ten incandescent lights will illuminate each car at night, so that the passengers can see to read. Instead of the regulation uniforms the motormen and conductors will wear black suits and black silk caps bound with gold braid.

Business News.

NEW INCORPORATIONS.

Lafayette, Ind.—A charter has been granted to the Sterling Electric Company, of Lafayette, which has been capitalized at $100,000.

Newark, N. J.—At the office of the county clerk, in this city, articles of incorporation were granted to the American Light, Power and Transportation Company, capitalized at $1,000,000.

Indianapolis, Ind.—With a directorate of three, the Thorntown Electric Light Company has been incorporated, its capital stock amounting to $15,000, one-half of which has already been subscribed.

Birmingham, Ala.—The Boykin-Bullock-McCall & McDonnell Electric Company has been granted a charter with a capital of $40,000, subscribed by local interests. The company will manufacture and deal in general electrical supplies.

Half Moon, N. Y.—Capitalists of Utica, N. Y., and Bridgeport, Conn., have recently chartered the Dunsbach Ferry Electric Company, of Half Moon. The object of the company will be the supplying of electricity for light, heat and power in Watervliet and Half Moon.

Crossville, Tenn.—A company whose intention is to light churches and the public streets has been incorporated recently with a capital of $2,000 and will be known as the Crossville Electric Light and Power Company. Generating apparatus has already been purchased and operations will soon begin.

Allentown, Pa.—Application will be made to the State authorities on December 3 for incorporation articles for the Siegfried Power Company, according to a local paper. The corporation will have a capital stock of $300,000, which will be subscribed by New York financiers, whose purpose is to erect a plant at Siegfried, operated by water power for generating 3,500 horse-power for electric power and lighting purposes.

Denver, Colo.—Hon. Henry V. Johnson, Denver's Mayor, and other capitalists of that city have recently incorporated the Automatic Railway and Switch Company, with a capital stock of $600,000, to manufacture street railway switches. The switch consists of a movable tip attached to a switch tongue, being operated by a rod which the motorman depresses with his foot. It is stated that the apparatus is very simple and that a factory will soon be established in Denver or the vicinity for its manufacture.

Dover, Del.—Among the list of corporations recently chartered in Dover, Del., are the following electrical companies: Bishop Electrical Company, of Wilmington, chartered for $50,000. Chicago Electric Motor Company, Wilmington: capital stock, $200,000. International Rapid Transit Company, of Dover; capital, $1,100,000. Jenkins Automobile Company, Dover; $100,-

000. Union Automobile Transportation Company, of Dover; $500,000. Canadian Searchmont Motor Company, of Wilmington; capital, $50,000.

TELEPHONE CALLS.

Chicago, Ill.—Local capitalists have incorporated the Continental Telephone Construction Company, of Chicago, their object being to operate and construct telephone systems within the State.

Columbus, Ohio.—Local capital has recently incorporated the Cauldwell Independent Telephone Company with a capital of $5,000. It is expected by the promoters that active operations will be begun in the near future.

ELECTRIC RAILWAYS.

Dover, N. H.—Application for a charter has been filed by the Portsmouth, Great Bay & Dover Street Railway Company, which will be capitalized at $75,000 capital, being subscribed by New Hampshire interests.

Everett, Wash.—The Monte Cristo Railway Company, of Everett, has been recently incorporated by three capitalists of that place to operated railways, telegraph lines, etc. The capital stock of the new corporation amounts to $1,200,000.

Boston, Mass.—The Electric Safety Traction Company, of this city, has recently been incorporated to build and equip electric railways. The capital stock will amount to $5,000,000, and be subscribed principally by Massachusetts interests.

Chester, Pa.—Under the name of the Philadelphia & Chester Railway Company, the Philadelphia & Baltimore Railway Company and the Prospect Street Railway Company have been consolidated and contracts have been let to Philadelphia contractors for building the line, the contracts including draw bridges over two streams, together with a large amount of modern car and electric machinery. It is expected that the new line will make twenty-minute runs from Chester to the Philadelphia line and reduce the time from Chester to Philadelphia itself to about an hour.

Norfolk, Va.—A disastrous fire temporarily crippled the street car service of Norfolk on the morning of November 11, destroying the power house, car barns and fifty-one cars belonging to the Norfolk Railway and Light Company, the loss reaching $250,000, which is said to be covered by insurance. Within a few hundred yards of the scene of the fire is the local depot of the Standard Oil Company, which had it taken fire would have wiped out the street railway entirely. Fortunately for the local company the oil was untouched by the flames and the few cars remaining to it were being run on the afternoon of the eleventh by power supplied from the electric light plant, which, being in the lower section of the city, escaped damage.

Allentown, Pa.—Another purchase has been made by the Lehigh Valley Traction Company, which has recently bought out the lines of the Allentown & Slatington Trolley, which is twenty-one miles long, running through the most important part of Lehigh County. Previous acquisitions of the company included the Slate Belt trolley line, which runs through the slate district in Northampton County. Altogether the company's direct system will have a total length of about fifty-three miles, which is said to be the longest direct trolley road in the world. The total length of the traction company's entire system is about 110 miles, but improvements which are soon to be made in the former extension from Slatington to Mauchunk will add twelve miles more to the length of the road.

CORPORATION CHANGES.

Dallas, Tex.—Concurring with the application of the American Land and Trust Company, of Boston, Mass., a receiver has been appointed for the Dallas Electric Company, from whom a $20,000 bond has been required. It is stated that the cause of the receivership is the defaulted payment of interest on $300,000 worth of the Dallas company's bonds, which were held by the trust company.

Penn Yan, N. Y.—Papers were filed on November 5 in the office of the county clerk of Penn Yan, recording the formal transfer of the Penn Yan Electric Light and Power Company, the first deed being given by Guy D. Hills, who some time ago bid in the plant at a receiver's sale for $1. Though the sale price is small there are $362 worth of revenue stamps on the document. The second deed given by the stockholders of the plant is considered merely formal. Among the other papers was the mortgage given by the electric light company, which will hereafter be known as the Yates Electric Light and Power Company, the mortgage being executed in favor of the City Trust Company, in New York, for $125,000.

AUTOMOBILES.

Saratoga, N. Y.—The Hudson Gas Motor and Vehicle Company has been incorporated by New York capitalists for $100,000.

Albany, N. Y.—With a capital stock of $100,000 the Hudson Motor Vehicle Company, of Saratoga, N. Y., has been incorporated by local capitalists.

Chicago, Ill.—Local capitalists have incorporated the Auto Appliance Company, with a capital stock of $50,000, to manufacture automobile accessories.

Wheeling, W. Va.—New York capital has recently incorporated another automobile manufacutring company for $250,000. The new corporation will be known as the Steam Motor Company of New York city, with its principal offices there.

NEW INSTALLATIONS.

New York City.—Contracts have been let by the Board of Public Improvements in New York city for lighting during the ensuing year, as follows: Manhattan, $960,000; Bronx, $350,000; Brooklyn, $950,000; Queens, $360,000; Richmond, $130,000.



WESTON STANDARD

PORTABLE DIRECT READING

VOLTMETERS

AND

WATTMETERS

For Alternating and Direct Current Circuits.

The only standard portable instrument of the type deserving this name.

Write for our Catalogue of Portable Instruments.

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114-120 William Street, Newark, N. J.

BERLIN. European Weston Electrical Instrument Co., Ritterstrasse No. 89

LONDON. Elliott Brothers, No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 24. NEW YORK, DECEMBER 15 1900. Whole No. 709.

Novel Applications of Electricity.



THE TWENTIETH CENTURY PIANOPHONE.
The gentleman standing on the left is Mr. G. Howlett Davis, its inventor.



THE PIANOPHONE IN CUBA.

THE "TWENTIETH CENTURY PIANOPHONE." THE LATEST INVENTION OF GEORGE HOWLETT DAVIS.

George Howlett Davis, the inventor of the pianophone, possesses all the characteristics and a scientific, mechanical and business sense which are looked for in the make-up of a successful inventor. The child of his brain, the pianophone, cannot be adequately described merely as an electrically operated piano, as it goes much further than this, through the possession of qualities which make it a thing of great interest to trained musicians as

well as laymen. The mere mechanical reproduction of musical sounds is not in any sense the function which the pianophone performs. It handles a melody or composition with grace and art; in fact, with finesse. This is where the human element enters into the pianophone and gives it, in a sense, the quality of interpretation. The combination of abilities found in Mr. Davis are rare, the inventive faculty combined with musical instinct. The imaginative and poetic enter so largely into the musician that little room is left for the seemingly colder and more prosaic application of scientific principles.

For this reason the Pianophone possesses advantages over other types of musical reproducers which are admitted by the electrical and musical world. In the first place, the motor forms an integral part of the suspended action, thus dispensing with all the wires and belts formerly used to connect the old separable motor. Both bearings and some other parts of the old motor are also done away with in this new type. As a result of this improvement and the ability to use a very small friction roller in the new device, the energy necessary to run the Pianophone is only one-half of that formerly used. In other words, the capacity of the storage or primary battery has been doubled. The largest size of storage battery which would formerly run the old form of device ten hours will run the new type twenty hours or play 240 average rolls with only one charging. This also applies to the primary battery. Primary batteries are used as a source of power where electric light service is not available. The simplification in the mechanism and the consequent decreased liability to get out of order have added to the efficiency of the "Twentieth Century Pianophone." In the playing the improvement is in the direction of a more regular tempo and a more distinct repetition of the short notes. The application of the attachment to a piano is extremely simple, there being no wires or belts to be connected from the motor to the action, no motor to be set and no change is ever made in the trap work at the bottom of the piano. All the work necessary consists in attaching two large bolts in order to secure the attachment to the keyboard, and this can be accomplished by any person possessing the slightest mechanical skill. Connecting the two battery wires to the binding posts completes the work. The following letters have been received by the manufacturers:

Morse Iron Works,
Foot 26th and 27th Streets,
Brooklyn, N. Y., Dec. 8, 1900.

The Pianophone Co., 249-251 Willoughby St., Brooklyn, N. Y.

Gentlemen:—Having recently returned from a trip around the world on the U. S. transport Logan, I feel it due to you to report that the Pianophone which our company had you place on that vessel gave entire satisfaction, and that the only repair necessary was to tighten up one of the belts.

Considering the constant jolting which the Pianophone received, especially during stormy weather, it withstood successfully a wonderful test as to durability.

Furthermore, your piano player proved the principal source of entertainment during our long trip.

It was on account of the above that our company placed an order with you to install another Pianophone on the U. S. transport Burnside. Yours respectfully,

(Signed) WILLIAM H. RAAB,
Supt. Morse Iron Works.

All U. S. transports will hereafter be equipped with Pianophones.

THOMAS E. CURTIS.



BROOKLYN FACTORY OF THE PIANOPHONE CO.
Showing a detached twentieth century pianophone in upper central part of view.

Almacen De Pianos Y Musica,
Amistad 90.
Habana, 12 de November de 1900.

Dear Gentlemen:—I have received the printed matter you very kindly sent me, and I am very much obliged to you for same. Enclosed you will find photo of my workbench, showing how I manage to attach the Pianophone on piano. I attached it myself, following your excellent instructions, and further still, I ventured on making a regulation of the shoes on cylinder. When everything was finished and the current placed, to my great astonishment and pride it worked first rate, not missing a note and without any further need of touching. The attachment is giving complete satisfaction to the purchaser, who has it operating continually. I find it to be a good strong attachment, easy and simple to attach, beautiful touch and splendid interpretation of the music it plays, especially in the most difficult classical music.

Yours truly, THOMAS E. CURTIS.

The factory of the Pinanophone Company is at Nos. 249-251 Willoughby street, Brooklyn, N. Y. Salesrooms, 5 East 14th street, New York City, where the Pianophone may be seen in operation. The company will be pleased to send further details, prices, etc., on application.

PRACTICAL ELECTRICITY FOR EVERYBODY.

SPECIALLY PREPARED FOR STUDENTS AND ELECTRICIANS.

THE DYNAMO AND ITS CONSTRUCTION.

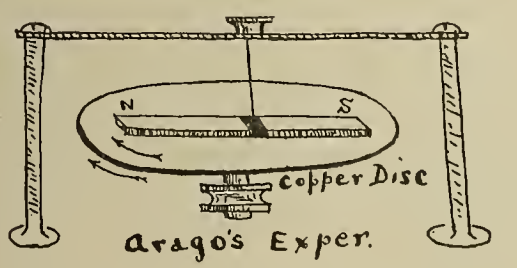


RAGO in 1824 noticed that a magnetic needle would not swing as often when near a metallic body as it would when isolated from it. Copper exercised the most strik- effect, and was spoken of as being able to reduce the oscillations in a short while from 300 to 4.

In 1825 he discovered that a plate of copper, rotated under a suspended magnet, caused the magnet to deflect in the direction of motion. Two other experimenters, Bubbage and Herschel, repeated Arago's experiment and drew up a table showing the relative effects of this action on different metals:

Copper,	100.
Zinc,	95.
Tin,	46.
Lead,	25.
Antimony,	9.
Bismuth,	2.

Faraday with characteristic genius explained these effects in a maner acceptable even to the most sceptical minds. The rotation of the magnet above the copper disk generates currents in it which react upon the magnet. The way in which they react is to destroy the swing of the needle, in the first case, or force the magnet or needle out of its customary position in the second. The law, framed by Lenz, which covers all such cases in which a magnetized body and a metallic mass move in each other's neighborhood is as follows:

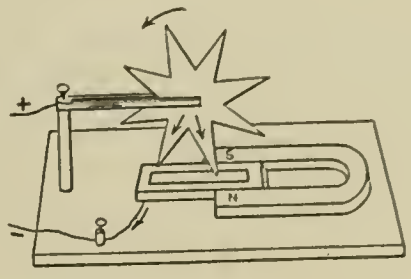


Arago's Original Experiment.

Lenz's Law.—In all cases of electromagnetic induction, the induced currents have such a direction that their reaction tends to stop the motion which produces them.

It is but necessary to appreciate this fundamental fact, and the phenomenon of electromagnetic induction in all its phases appears as but a simple and reactionary effect. In fact, to some minds the presence of a current by the movement of the magnet was expected. A force cannot be applied at one point without producing some equally disturbing effect at another. Matter is simply the material by which a given amount of power is transmitted and, therefore, a swinging magnet radiating lines of magnetic force must create in the conductor they strike some such remarkable effect as we perceive. The idea of Faraday's regarding the disk of Arago took root. Faraday himself, in 1831, discovered the principle of induction; he followed the path of Arago and constructed a small dynamo. It consisted merely of a disk of copper revolving between the poles of a magnet, but it give a continuous current and was named the Faraday disk dynamo.

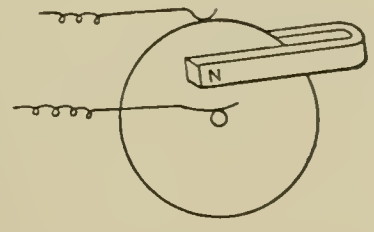
To-day machines are used of the same construction in some electro-metallurgical works. Noting in mind the fact that a magnet moved in front of a conductor has its motion resisted, or the converse, a conductor moved past a magnet has its motion resisted, the reason why such retardance is necessarily due to induced currents becomes pretty evident. A magnet moving through the



Barlow's Wheel.

air cannot be held any more than any other object, unless by the presence of another magnet. Neither have touched, yet they either repel or attract each other.

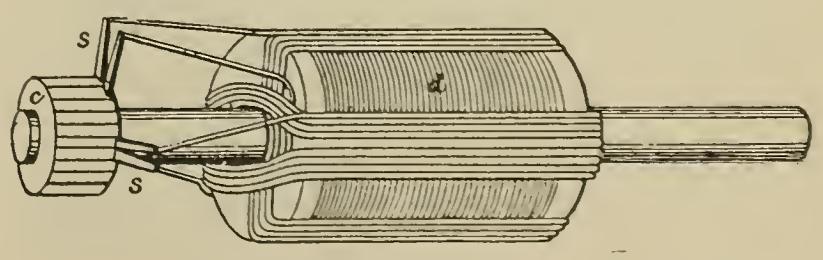
If currents are induced in a mass of metal or a conductor by a magnet, and the production of such currents means resistance to further motion, it is highly evident that the disturbing influence is magnetic, otherwise the magnet would be unaffected. Also the currents which



Faraday's Disc Experiment.

are reduced, and which affect the moving magnet, must hold it back when it moves away and push it away when it moves back. Any movement whatever restrained, and this restraint is investigated from these two standpoints.

(1) Motion of magnet to a coil.
(2) " " " from "

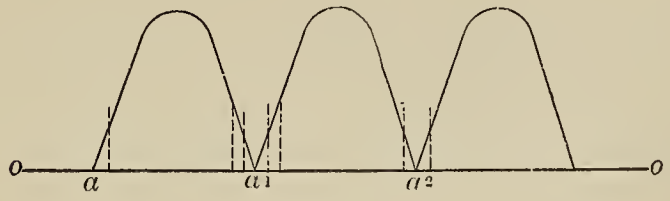


Winding of a Drum Armature.

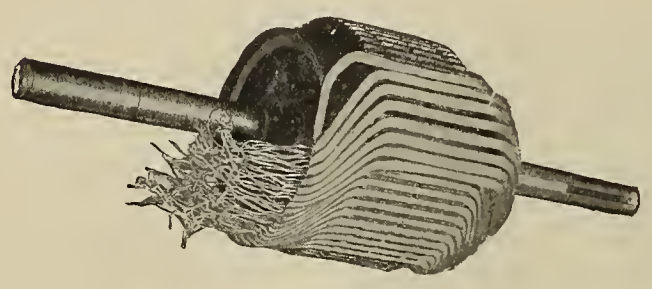
Motion of Magnet to a Coil.—The magnet may be moved toward a coil, forming a closed circuit, or the coil towards the magnet, as shown in the last sketch.

In either case the direction of the induced current is such that power is consumed. It is to be understood that no resistance is felt if the wire is open, but if closed the law of Lenz regarding the induced currents, their direction and reaction, becomes evident at once. When the coil is open an electromotive force is set up in it. The

current does not flow, although the potential at each end would cause it to at once were the circuit closed. The movement of the coil brings it within the varying influence of the lines of force of the magnet. It passes when approaching the pole from a weaker to a denser field;



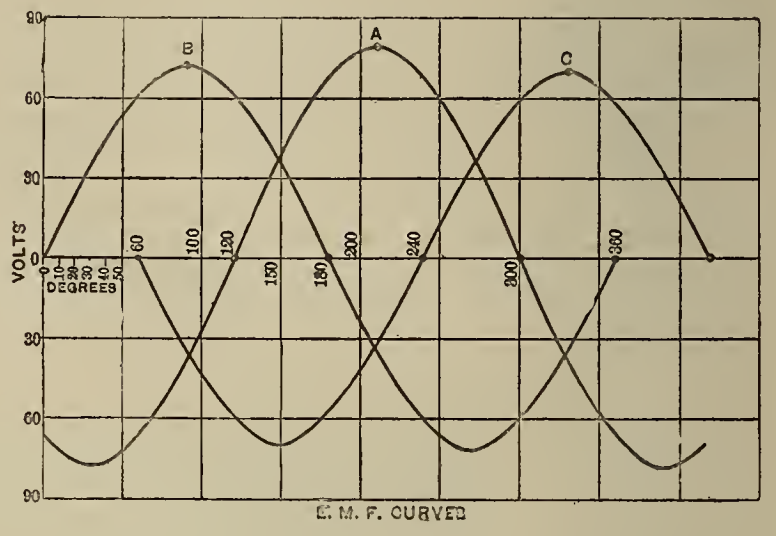
on leaving, from andenser to a weaker. If the magnet were very big and strong, and the coil large, the labor of quickly moving it would be severe. The reaction set up between the magnet and coil, which causes work to be done, is entirely magnetic. The lines of force encircle the coil and are cut; a current is set up whose



magnetic effect forces up to expend energy in continuing the motion.

The entire phenomenon is therefore simple enough from this standpoint—the attraction or repulsion of unlike or like poles. This final effect always occurs, the induced current having a direction which can be predetermined by this means. A coil approaching a north pole will have induced in that side of the coil nearest the pole a current flowing against the hands of a watch. A north polarity develops at that end and continues as long as the coil is moved in the neighborhood of the magnet.

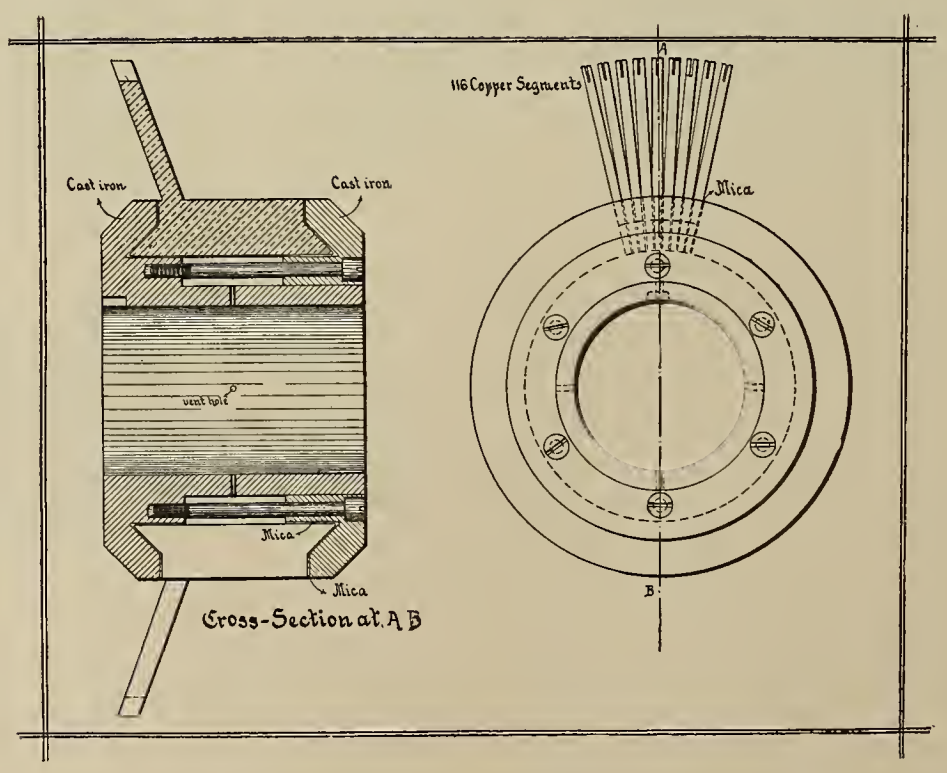
The current which produces this magnetic repulsion reverses in direction when the movement away from the magnet begins. The flow of an induced current is dependent upon the direction of motion as well as the polarity of the magnet.



The current which produces this magnetic repulsion reverses in direction when the movement away from the magnet begins. The flow of an induced current is dependent upon the direction of motion as well as the polarity of the magnet.

In the motion of a magnet to a coil the induced current opposes the further movement of the magnet.

Motion of Magnet from a Coil.—When a magnet is moved away from a coil, or lifted out of its embrace, the induced current flows in such a direction that resistance is felt. This is very noticeable with large magnets and coils; it can be indicated by means of a galvanometer with the very smallest. A retardation is felt, a sort of viscous resistance, which seems to be a dragging back of the magnet. It is again traced to Lenz's law for interpretation, and may be considered as directly due to a



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NEWTON HARRISON, E. E. Editor.

Walter Mueller, Managing Editor.

ASSOCIATE EDITORS.

Electric Light and Power.

Alfred E. Wiener, E. E.

Osborne P. Loomis, E. E.

Electro-Therapeutics.

Joseph Muir, M. D.

Frederick Strange Kolle, M. D.

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BUDDING ELECTRIC INDUSTRIES.

So many marked changes have been made in industral methods in the last decade that it is not surprising to realize that transformations, through the adoption of still newer methods, are about to become general For instance, inventions covering a method of train refrigeration have been crystallized, a company formed and successful tests made, covering a distance of many thousands of miles. In a case of this kind a trip over the Great American Desert would be no less effective in keeping the contents of the electric refrigerating car cool than if the trip had been taken through a locality notoriously cooler. The third rail system of electric traction is coming into vogue, and in all probability it will become so generally established that trunk lines will be equipped with it. At present the Brooklyn Elevated, the New Haven and Hartford road and the Manhattan Elevated, of New York, employ it. One of the latest inventions which will probably excite great interest is a new phonograph. It is not like the phonograph at present in use, an acoustic device of purely mechanical construction; this invention consists of a machine involving electromagnetic principles. It is essentially electrical in character. It is simple in construction and possesses the advantage of having a cylinder made of steel wire. Impressions may be recorded in characters which no man can read. Without the reproducing device there would be no physical indication that a record transformable into intelligent speech had ever been made. As an adjunct to the great telephone systems of to-day this device is indispensable, and it will play a prominent part in the future history of telephony.

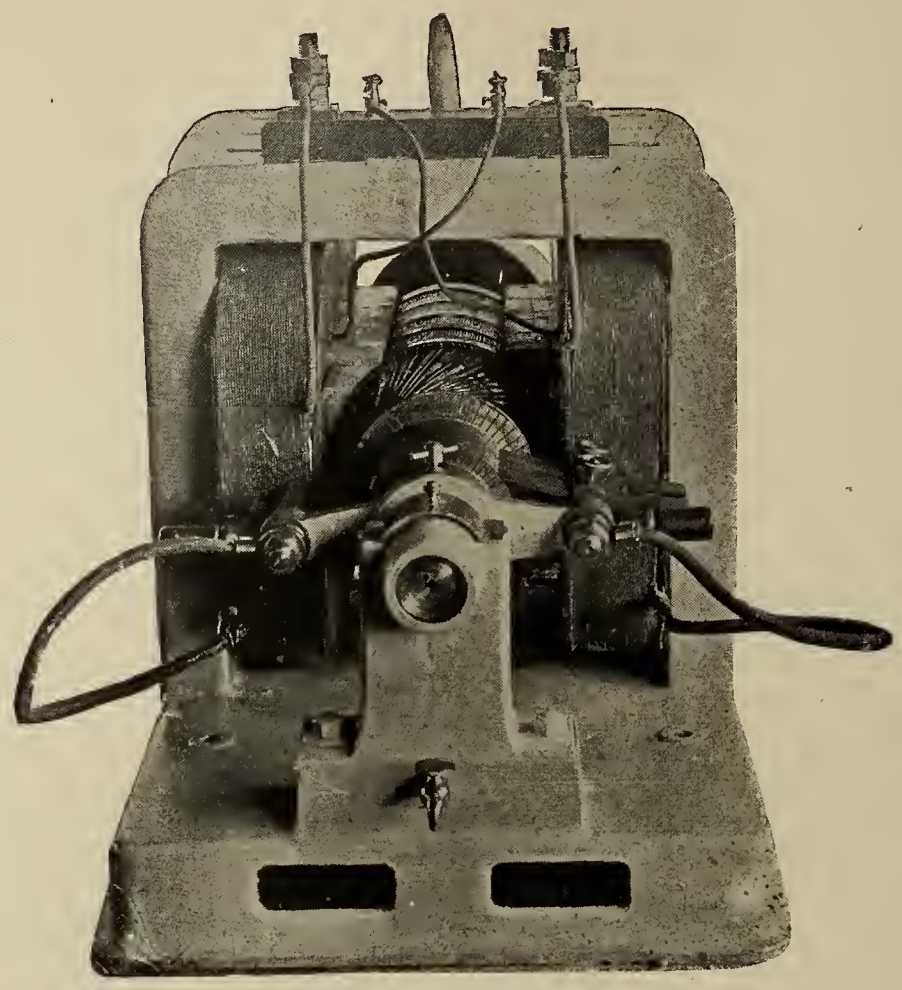
We might refer to budding industries of a somewhat different character and still only touch upon the surface. Some of the industries that are already well established are comparatively new; for instance, the manufacture of calcium carbide by electricity, of aluminum, of carborundum, etc. These are certainly budding industries, with a field opening for them that increases every day. In addition to what might be definitely included within the ranks of this class of inventions we refer to the widespread popularity of Tesla's inventions, the two and three phase motor and dynamo;, his system of power transmission, of vacuum tube lighting, etc. Many important inventions are being held in abeyance to-day, companies are slowly forming and capital is being obtained before they will be publicly introduced and their more valuable features generally recognized. The progress made in the art of invention in the field of applied electricity is of comparatively recent date. Ten years will cover the bulk of it; twenty years all of it, with few exceptions. New mining practices have been introduced of immense benefit to the handlers of copper ore; the introduction of electric drills has had its influence in mining; the electric pump, electric elevator, not to speak of the automobile, all these may be regarded as inventions that have not as yet covered the field they were intended to occupy. Each year is full of promise, and the quickness with which the public take to electrical inventions is not more astonishing than the practical benefits they immediately derive from them.

It has been estimated that the United States is exporting from her workshops manufactures to the extent of $1,000,000 a day. The increase in iron, steel and copper goods is simply remarkable, amounting to more than $50,000,000, and it may reach $100,000,000. In fact, since 1896 the ratio of increase has been enormous, exceeding all anticipations. It might be possible to draw a mathematical curve, showing the rate at which electrical inventions increase and the rate at which the industries developed from the increase. Co-ordinate points could be obtained of great interest to the general reader Probably one of the most promising applications of electricity, yielding in all probability the greatest proportion of profit, is street railways. The mileage in the United States has grown enormously, the aggregate representing thousands of miles of tracks and hundreds of millions of dollars' worth of stocks and bonds. The call upon the steel and copper industries and allied trades for the construction of these roads has meant the employment of an army of workers. The power stations built to accommodate the machinery, both dynamos and engines, required the services of architects, builders and engineers: the masons, bricklayers and carpenters also came in for their share. It would not be difficult to prove that one of the greatest operating causes, the immense hustle and activity taking place in the last four years, was due to the promulgation and application of the electrical inventions.

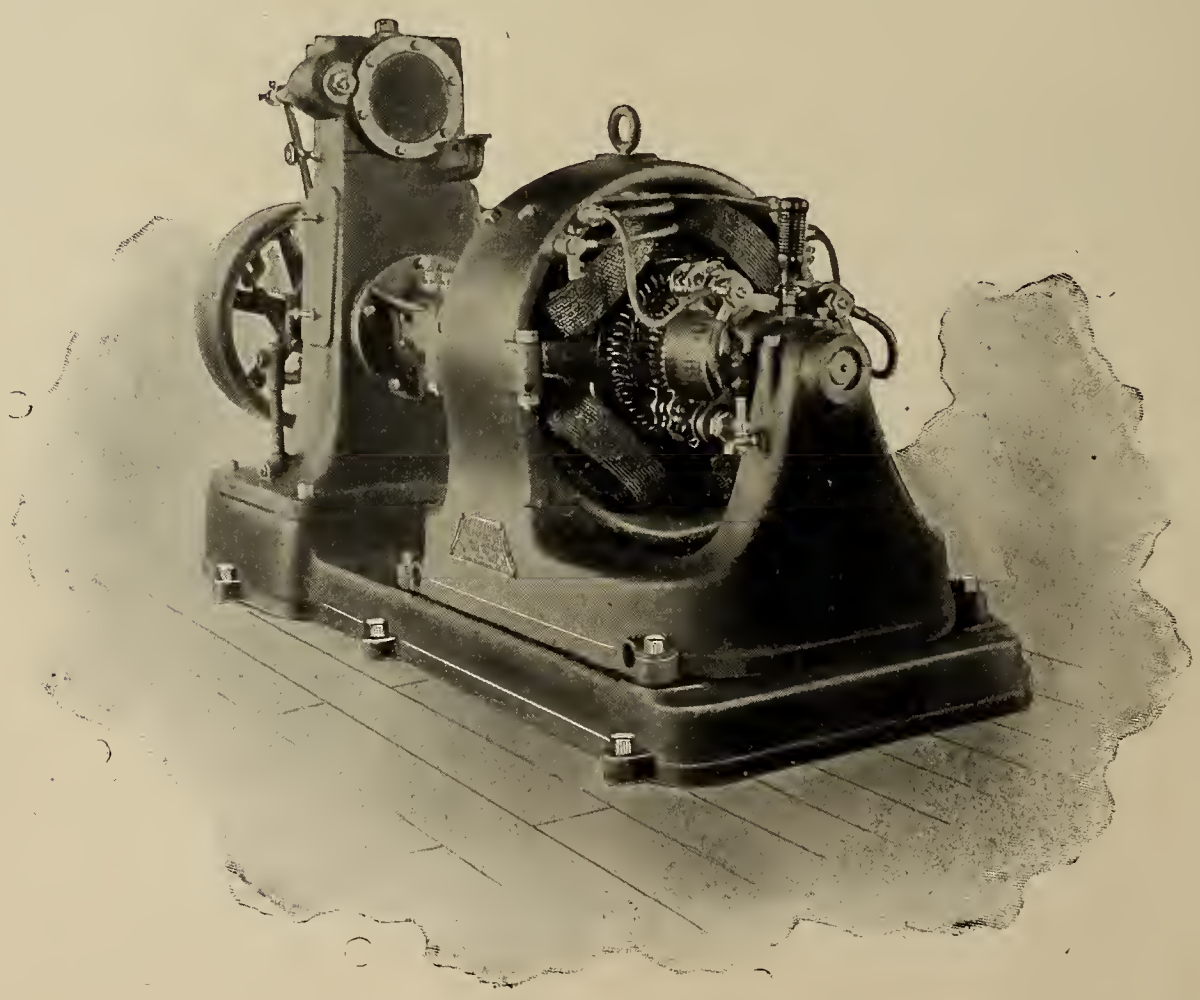
Electric signalling devices, particularly the telegraph and telegraphic systems in use in the United States, have not responded to the progressive influences at work. The thousands upon thousands of miles in use remain with their telegraphic equipment in pretty nearly the same condition as ten years ago. In other words, it seems as though diplex, duplex and multiplex systems of telegraphy have reached their maximum point of perfection, and the only radical changes effected there are such as emanate from the application of an entirely new principle. The Hertzian wave method so far has failed to establish itself upon a purely practical and commercial basis. For this reason changes here will be regarded with interest not unmixed with curiosity.

strong magnetic attraction which at once asserts itself. This attraction can only be due to unlike poles; it therefore follows that it is caused by a current of opposite direction to the first. The motion of a magnet from a coil induces a current which retards the further movement of the coil.

Simple Dynamo.—The principle just presented is made use of in the dynamo for the generation of heavy currents of electricity. Instead of a single coil moving back and forth in front of a magnet we have a succession of coils rotating on a shaft in a magnetic field. Each length of wire acts as an inductor, producing electro-



Type of Ironclad Dynamo.



Gederator Direct Connected to Engine.

motive force. The pressure developed depends upon three factors:

Lines of Force,
Inductors,
Speed.

The rule is as follows: If a wire rotates in a magnetic field, cutting one hundred millon lines of force per second, an electromotive force of one volt is developed.

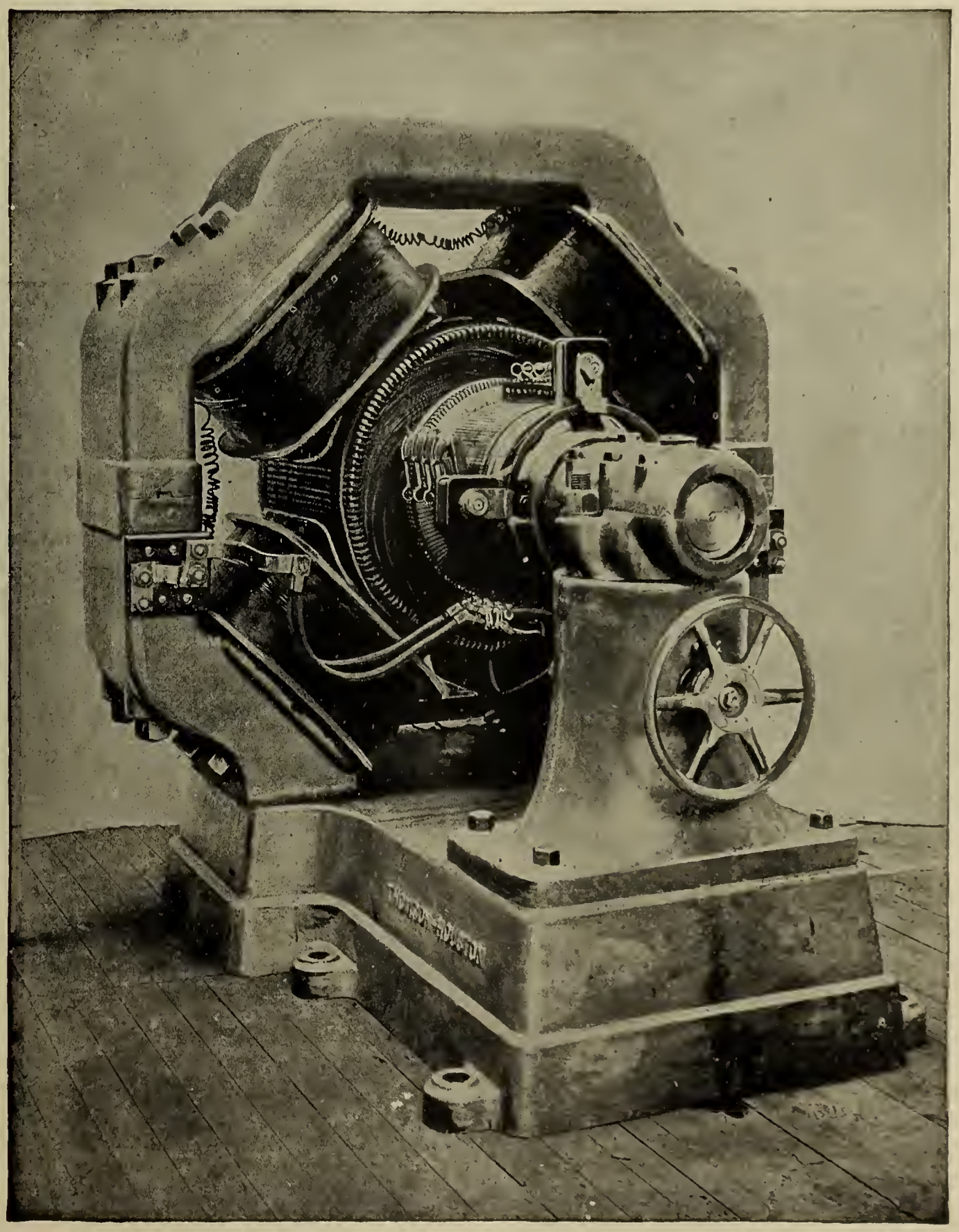
With two wires twice as much would be created, or with one-half the field and four wires. This rule is applied to dynamos for the calculation of pressure.

The method employed is not confusing or complicated, as given below:

$$\text{volts} = \frac{\text{number of inductors} \times \text{lines of force} \times \text{revolutions per second}}{100{,}000{,}000}$$

Taking the case of a dynamo of this construction,

Inductors = 100



Type of Arc-Lighting Machine.

Lines of force = 4,000,000
Revolutions per second = 25

$$\text{Electromotive force} = \frac{100 \times 4{,}000{,}000 \times 25}{1000{,}000{,}000}$$

Electromotive force = 100 volts.

The number of turns on an armature differ according to its use. For high pressures in arc lighting there are many turns; for low pressures, such as plating, very few. Between these two classes of machines are those used for incandescent lighting. Many changes are noticeable to-day in the construction of dynamos. The two groups called

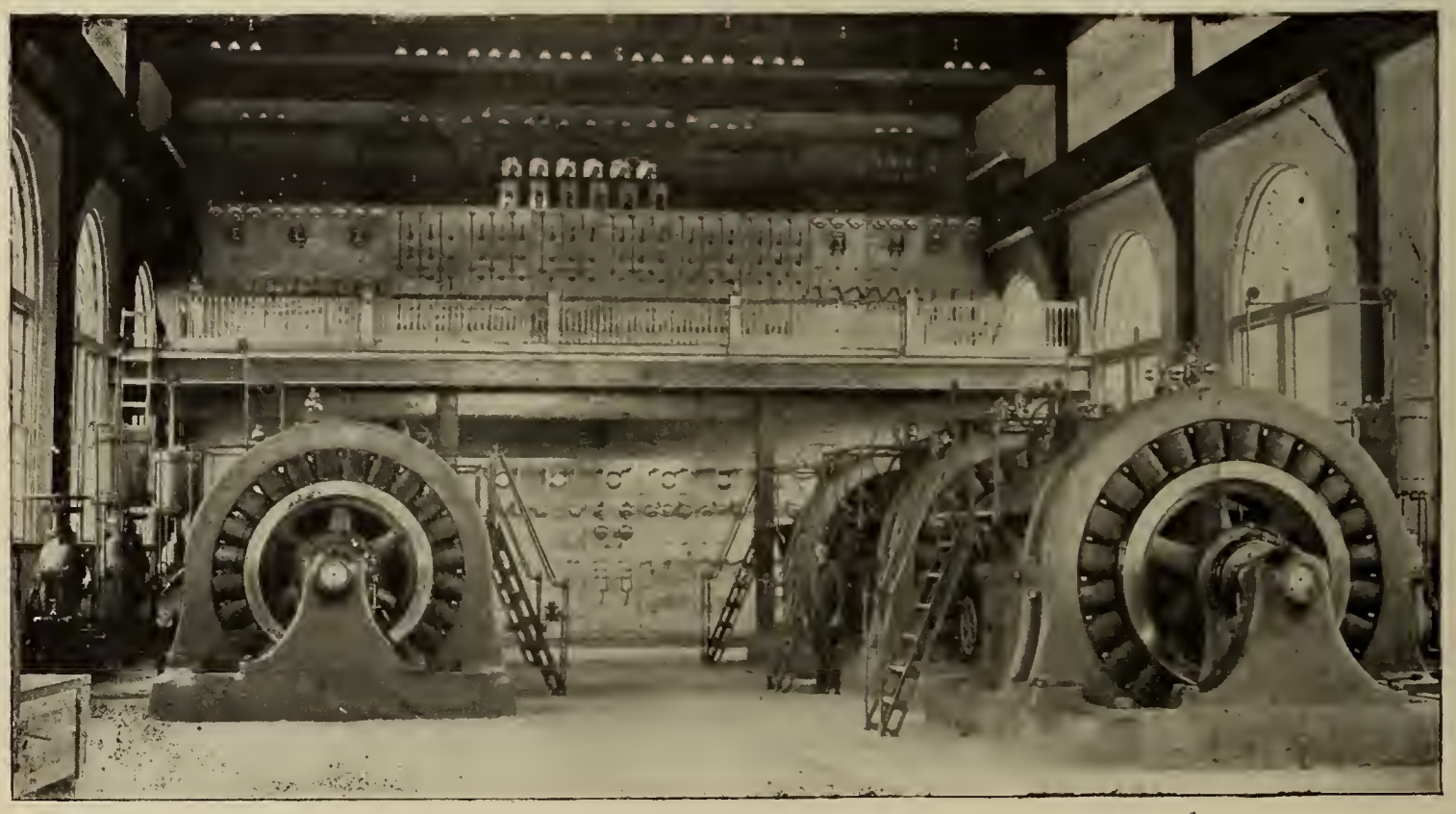
Bipolar or two-pole and
Multipolar or many poles

comprise all made with the exception of special types, some of which are built like Faraday's disk and others for alternating current work.

The Commutator.—The piece of mechanism which is used for the purpose of sending all the impulses out in one direction is called the commutator. It has been known in the past by another name, such as "rectifier" or "collector." As the armature rotates, the wires upon it individually generate a current; this is collected at the commutator bar connected to each one and received by the brush. One brush takes an positive impulses; the other all negative. As an inductor passes in front of one pole the current flows in an opposite direction to that it takes in passing in front of the other. This accounts for the use and necessity of a commutator.

Barlow's Wheel.—If Faraday's disk is taken and allowed to dip into a trough of mercury connected to one wire, the other going to the shaft, and a current be applied, the wheel will rotate and perform all the functions of a motor.

This wheel, which is simply an application of Oerted's principle, is the type of all modern motors.



Dynamo Room in a Transmission Plant.

TELEGRAPHING ACROSS THE ATLANTIC WITHOUT WIRES.

Mr. Marconi, according to a cable dispatch, states that he expects to be able to establish wireless telegraphic communication across the Atlantic next year, having solved the difficulties which have hitherto stood in the way of its successful accomplishment.

In the Telephone Field.

COMBINATION OF TELEPHONE INTERESTS.

Plans for the combination of the independent telephone companies of the United States are rapidly nearing completion and details will be announced shortly. An agreement has been practically reached. Alexander Brown, of Baltimore, is a leader in the movement.

The proposition is to combine the Maryland Telephone and Telegraph Company of Baltimore, the Pittsburg and Allegheny Telephone and Telegraph Company of Pittsburg, the Home Telephone Company of Pennsylvania, the Allegheny County Telephone Company of Pennsylvania, the Delmarvia Telephone Company of Wilmington, Del.; the Erie Telegraph and Telephone Company of Boston, which controls the Cleveland Telephone Company; the Northwestern Telephone Exchange Company, the Southwestern Telegraph and Telephone Company, the Michigan Telephone Company and the Wisconsin Telephone Company. The Telephone, Telegraph and Cable Company of America, the largest of its kind in the United States, will be included. The Erie Telegraph and Telephone Company and affiliated lines operate one-sixth of all the telephones in the territory of the American Bell Telephone Company.

Behind the proposed combination are some of the most influential capitalists and institutions in the United States, including the banking house of Alexander Brown & Sons, Harry A. Parr, of Baltimore; the Astors, of New York; Henry C. Payne, of Cleveland; Charles J. Glidden, David S. Greenough, Asa C. Russell, and Levi Sprague, of Massachusetts.

The capitalization will be about $50,000.000. The new company will not invite a war with the Bell Company, but is determined to protect its rights, and will be prepared to engage in hostilities should the Bell Company be disposed to harass it. The new company will have a total of 170,000 subscribers.

The Automobile.

THE RIKER ELECTRIC VEHICLE COMPANY ABSORBED BY THE ELECTRIC VEHICLE COMPANY.

It was announced last week at a meeting of the Board of Directors of the Electric Vehicle Company that the company had bought out the entire plant of the Riker Electric Motor Vehicle Company. At this meeting the

Board of Directors was reorganized to meet the new conditions, and new officers were elected. The absorption of the Riker Company will give the Electric Vehicle Company, according to the statements of its officers, a complete monopoly of all the patents for manufacturing electric vehicles in this country, and will probably also give it control of all the patents for gasoline vehicles. The Riker Company will still retain its plant at Elizabeth, N. J. Its stockholders, however, will hold stock in the Electric Vehicle Company, instead of in the Riker.

The transaction is simply an absorption of the stock of the Riker Company. The Riker Company had $4,000,000 worth of common stock and $1,000,000 worth of preferred stock. The Electric Vehicle Company had $8,000,000 worth of preferred and $10,000,000 worth of common stock. By the exchange of stock from the Riker Company its preferred and common stock will each be increased by $1,000,000.

By the reorganization George H. Day becomes president of the Electric Vehicle Company. He was formerly president of the Columbia Electric Vehicle Company, which was merged into the present Electric Vehicle Company some time ago. He succeeds Robert McA. Lloyd, who resigned. John Jacob Astor resigned from the Board of Directors, saying that he would not be able to be in the city much during the coming winter. By his request George Chapman, his representative, was placed on the board. T. C. Stevens, of Washington, D. C., formerly president of the Riker Company, is now on the Board of Directors. T. J. Regan, the representative of W. C. Whitney, is also on the Board of Directors, W. H. Johnson, who was general manager of the Electric Vehicle Company, was elected second vice-president, and A. L. Riker, who had been second vice-president of the Riker Company, was elected third vice-president of the Vehicle Company. H. M. Byllesby, formerly general manager of the Riker Company, was elected first vice-president.

AUTOMOBILES IN COLOGNE.

By Charles E. Barnes.*

There are in all about 130 automobiles and motor wagons in use in the city of Cologne, and most of these were manufactured here.

Police regulations require that all automobiles and motor wagons shall be registered. The speed at which they are allowed to run must in no case exceed 12 kilometers (7.4 miles) per hour. The average selling prices are about as follows: Tricycles, 1,200 marks ($285.60); small four-wheelers, 3,000 marks ($714); and carriage sizes, 8,000 marks ($1,904).

The future of the automobile seems assured, not only for the freight wagon, but for the pleasure vehicle as well.

The following are the names and addresses of the manufacturers and dealers in Cologne:

Allgemeine Betriebs-Actien Gesellschaft (manufacturers), Wolfstrasse 1a.

B. Castenholz (dealer), Aachenerstrasse 25.

Emil Cazin (dealer), Blaubach 44.

Ernst Heinrich Geist (manufacturer), Zollstock, Huningerweg.

Rudolph Hagen (manufacturer), Hohenstaufenring 32.

Gustav Helmke (dealer), Blindgasse 2.

Carl Hoppe (dealer), Schildergasse 70.

Kuln, Elektric-Actien Gesellschaft (dealers), Richmondstrasse 13.

Louis Lefrere & Cie. (dealers), Hansaring 17.

Maxwerke Electrik and Auto. Gesellschaft (manufacturers), Hohenstaufenring 14.

Heinrich Scheele (manufacturer), Mastricherstrasse 41-43.

J. B. Utermohle (manufacturer), Friesenplatz 25.

*U. S. Consul at Cologne, Germany.

THE COFFIN "MOBE."

In 1834 the "mobe" was the freak vehicle for the living, to-day it is for the dead. There is always an alert eye ever ready to see something funny at a funeral, and any attempt of the corpse at being lively is regarded with great awe and discomfort by the condoling friends.

One day last month an up-to-date Jersey undertaker was guilty of "scaring the parson into fits, frightening the people out of their wits" at a funeral he was conducting in a church, when the catafalque, containing the mortal remains of a respected old Metuchen citizen, sped up the aisle, with no one pushing, no one pulling it.

The pallbearers, seeing that "nothing was doing," quickly rushed for the doors with all the others following panic-stricken.

The progressive undertaker shouted "Hey, there! Hey, there! It's all right. It's only an automobile. Come back."

The mourners returned smiling sadly and to each other solemnly whispered: "This is on the dead."

"Men must endure their going hence,
Even as their coming thither."

L. E. K.

THE WESTCHESTER AUTOMOBILE CLUB.

The Westchester Automobile Club is the name of a new organization which has been formed by a number of well-known New Yorkers, many of whom own country seats in the northern part of Westchester and along the northern shore of Long Island Sound. The club purposes to establish supply stations for motor vehicles on the country roads leading to the Ardsley Casino, the Knollwood Country Club, and the Westchester Country Club.

The club already has forty members, among them being Paul Gilbert Thebaud, Percy Chubb, Sidney Chubb, W. K. Vanderbilt, W. K. Vanderbilt, Jr., Worthington Whitehouse, George Fordyce Leith, Henry Graef, J. Scott McComb, E. S. Reynal, Gen. George M. Smith, Oliver Harriman, Jr., J. Dunbar Wright, Albert C. Bostwick, Bradford B. McGregor, F. W. S. Cochrane, and Frederick W. Geissenhainer.

MOONSHINE IN "THE SUN."

The New York "Sun" states that according to a despatch in the "Philadelphia Record" the bald poll of a Cleveland engineer is releaving luxuriantly as a consequence of working under an electric belt. "The hair," said the man's physician, "has been sprouted by electricity." What wonders will not electricity preform? Doubtless it will do as much for the smooth cheek as for the smooth head; and the wild craving of ingenuous youth for beards may be satisfied by means of omnipotent electricity. A palm-leaf fan in the electric light works of Saugus, Mass., is already producing dates in small quantities.

We can now expect "The Sun" to furnish its readers with smoked glasses in order to protect their eyes from the brilliant rays thrown out from its columns.

The Telegraph.

NEW CABLE BETWEEN NETHERLANDS AND ENGLAND.

The laying of a third telegraph cable between the Netherlands and England, from Zandvoort to Lowestoft, was commenced on the 8th of October last. The cable comprises four wires, which will extend all the way from London to Rotterdam and Amsterdam. Telegraphing over these wires will be done by means of the Hughes apparatuses, and at busy times with duplex Hughes apparatuses. The cost of construction of the cable will be borne by both countries. The cable, which will be ready for use in a few days, will greatly accelerate the telegraph traffic between the Netherlands and England. The new connection will also expedite the receipt of American cablegrams via London, as one of the wires will be immediately connected with the cable of the Anglo-American Telegraph Company at London, thus making cabling to the United States possible without the intervention of the London office.

Miscellaneous.

AMERICA'S GREATEST RAILROAD.

America is the possessor of the best railroads in all this world, and when it is said that the greatest of them is the New York Central and Hudson River system a sweeping statement is made, but one that is absolutely true nevertheless. For a railroad, or any concern for that matter, not to have a peer in America is a most laudable position. Such rank can be gained in only one way, and that is by establishing a system that stands for perfection, and when that is attained the popular verdict of being "the greatest" is sure to follow. That is the verdict unversally accorded to the New York Central.

While the Central has obtained the most coveted position in the railroad world, there seems to be no satisfying its desire to better its service. Millions are being expended for improvements so great that they are almost stupendous. Scores of new bridges are being built; new stations are under course of construction, and the development in rolling stock and road bed is not allowed to flag for an instant. Not only is the traveling public benefited by these improvements, but the expenditure of these millions is of inestimable value to every town through which its lines pass, for labor and all kinds of business greatly profit thereby.

The leasing of a railroad by the New York Central means a betterment in service of the lines over which it has secured control, and this rule will undoubtedly prevail in the case of the Boston and Albany. The announcement that the mileage books of the Central with its two-cent-per-mile rate of fare will be good on the B. & A. lines must be very gratifying to all holders of that form of transportation. This concession is in line with the very liberal policy of the road. The New York Central is a corporation, and a great one at that, but it is not arbitrary and monopolistic in its dealings with the public. It is ever alert to regard the interests of its patrons.—Schenectady (N. Y.) Union.

Patents.

WEEKLY ELECTRICAL PATENT RECORD. PATENTS ISSUED NOVEMBER 27, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of five cents.

662,386. Electric traction for tramway or similar vehicles; A. Baisieux, Brussels, Belgium.

662,409. Apparatus for separating gold from magnetic sands; Elmer Gates, Chevy Chase, Md.

662,410. Magnetic separator; Elmer Gates, Chevy Chase, Md.

662,411. Magnetic separator; Elmer Gates, Chevy Chase, Md.—Comprises a magnet pole-piece grooved or recessed to produce a wavy, zigzag or tortuous distribution of the effective lines of force, in combination with a traveling screen or apron moving in front of the pole-piece, and means for jostling the apron.

662,412. Magnetic separator; Elmer Gates, Chevy Chase, Md.—Comprises a magnet pole-piece grooved or recessed to produce a wavy, zigzag or tortuous distribution of the effective lines of force, and a rotary screen front of said pole-piece.

662,414. Magnetic separator; Elmer Gates, Chevy Chase, Md.—Comprises a magnetic cylinder having grooves or recesses in its periphery, said grooves or recesses having a zizag or wavy arrangement, so as to provide corresponding wavy or zigzag magnetic fields of force, and a traveling apron passing over said cylinder.

662,419, 662,420. Electric railway; W. Grunow, Jr., Bridgeport, Conn.

662,421. Electric railway; W. Grunow, Jr., Bridgeport, Conn.

662,422. Electrical resistance; W. Grunow, Jr., Bridgeport, Conn.—An electrical resistance and circuit connections therefor, together with insulated conductors attached to said circuit connections, said resistance, circuit connections and the ends of the insulated conductors being wholly embedded in a non-absorbent insulating mass.

662,423. Current collector; W. Grunow, Jr., Bridgeport, Conn.—A current collector or trolley consisting of two contacting or conducting shoes yiedlingly secured to a supporting-frame by vertical sliding standards and pivotpins, and an inter-connecting yoke.

662,444. Insulating composition; C. Jung, Vienna, Austria-Hungary.—A mixture of undissolved raw caoutchouc and casein.

622,450. Controller for electric motors; J. B. Linn, Schenectady, N. Y.

662,463. Casing for electrical-conductor joints; G. H. Paul, New York, N. Y.

662,465. Commutator; E. D. Priest, Schenectady, N. Y.—A commutator composed of segments of conducting material separated by insulation not extending to the general level of the segments.

662,466. Lightning-arrester for safety cutouts for electric circuits; Jos. Sachs, Hartford, Conn.—A safety cutout, a case therefor, and a metal end cap, a sleeve surrounding the said case and adjacent to said cap and a connection from said sleeve to ground.

662,480. Automatic circuit-controller; G. H. Whittingham, Baltimore, Md.—A circuit-controller, two shunt-circuits around the same, a cutout in each shunt, one of which is operated by the circuit-controller.

662,484. Electric top for gyroscopes; E. Ziehl, Berlin, Germany.

662,491. Portable electrical device; J. S. Mead, Buffalo, N. Y.

662,497, 662,498. Railway-crossing signal; N. Ratchford, Greenville, Ohio.

662,501. Safety cutout for electric circuits; Jos. Sachs, Hartford, Conn.—Comprises two connected portions in one line for the passage of the electric current, the one portion a section of material of low conductivity to be heated, and the other portion a piece of material of high conductivity connected by a joint fusible by an excess of heat of the low-conductivity section.

662,510. Incandescent-lamp socket; E. P. Werner, Chicago, Ill.

662,527. Telegraph signaling apparatus; E. B. Ellicott, Chicago, Ill.

662,537. Electric smelting furnace; H. Koller, Nuremberg, Germany.

662,543. Telephone switch; L. M. Neher, North Manchester, Ind.

662,549. Semaphore-operating mechanism; J. Shoecraft, Eskridge, Kan.

662,580. Apparatus for lighting railway carriages; C. Vicarino, Nancy, France.

662,587. Insulated support for electric conductors; C. C. Blake, Portsmouth, N. H.

662,622. Electric battery; A. W. Harrison, Los Angeles, Cal.

662,630. Brush-holder for electric machines; S. H. Short, Cleveland, Ohio.

662,657. Electric burglar alarm; H. Rohrdantz, Buffalo, N. Y.

662,679. Reversible primary battery; L. W. Pullen. Camden, N. J.

662,707. Electrical connector; H. Blackman, New York, N. Y.—A plate for electrically connecting surfaces comprising a conducting body formed with an aperture, a packing-ring extending circumferentially around said body, and a packing-ring in said aperture.

662,719. Electric fire-alarm; C. L. Haight, Poughkeepsie, N. Y.

662,727. Attachment for arc lamps; E. B. Jones, Chatham, Canada.

662,752. Transmission of electrical impulses; Fred Bedell, Ithaca, N. Y.—Consists in generating dynamically a series of undirectional impulses of electro-motive force, transmitting over a circuit code-determined current impulses each complete from zero and receiving the transmitted impulses by means of suitable receiving apparatus.

662,758. Commutator brush-holder; H. Bishop, New York, N. Y.

662,772. Electric motor; J. Darling, Chicora, Pa.

662,784. Apparatus for interrupting relatively high-potential circuits; Wm. Grunow, Jr., Bridgeport, Conn.

662,785. Apparatus for rupturing high-potential electrical circuits without dangerous arcing; Wm. Grunow, Jr., Bridgeport, Conn.

662,803. Burglar alarm; J. L. Murphy, Denver, Colo.

662,833. Railway signaling; S. D. Strohm, Philadelphia, Pa.

662,852. Method of producing surfaces for printing; E. Hett, New York, N. Y.

Business News.

NEW INCORPORATIONS.

Nashville, Tenn.—The Bristol Light and Power Company, of Bristol, has been recently incorporated for $25,000 by local interests.

Indianapolis, Ind.—A new corporation of Linton, Ind., is the City Lighting Company, incorporated on November 8 with a capital stock of $10,000. The directors and promoters are all local men.

Dover, Del.—Among the recent incorporations in Dover is that of the Consolidated Safety Third Rail Electric Company, of New York. This company is capitalized at $100,000.

Mt. Gilead, O.—The Mt. Gilead Water, Light, Heat and Power Company has been incorporated with a capital stock of $60,000. The company will furnish light, heat, water and power to the citizens, and will build a plant for its manufacture.

Trenton, N. J.—The Dynelectron Company has been incorporated, with a capital of $1,200,000 in common stock, to manufacture and deal in electrical supplies. Inventions which have been bought by the company will be handled as well as outside goods.

TELEPHONE CALLS.

Danville, Ill.—Charles F. Howorth, William Henderson, John Fletcher, all of this city, incorported the Vermilion County Telephone Company, at Springfield, on November 16, with a capital stock of $60,000. The company will operate a telephone system in Danville or vicinity and expects to commence active operations in the near future.

ELECTRIC RAILWAY NEWS.

Toledo, O.—A company which will invest $2,000,000 intends to build an electric road from Toledo to Defiance. Rights of way have been obtained along almost the entire route.

Albany, N. Y.—Certificates have been filed with the Secretary of State by the Amsterdam Street Railroad Company for the extension of its line through several villages to Hagamans.

Columbia, Pa.—Unless present indications are at fault, the Columbia-Montour Electric Railroad will be soon in process of construction. When completed the road will run through Riverside and other intermediate towns to Nescopeck.

Ionia, Mich.—A franchise has been granted to the company which intends to run an electric line along the north side of Grand River, from Ionia through Saranac and intermediate points to Valley City. The line will be single tracked.

Tacoma, Ore.—The Tacoma Common Council has granted a franchise to the Tacoma Railway and Power Company for the construction of a line which will enable its city-bound South Tacoma cars to avoid the crossing of the De Lin street bridge.

Camden, N. J.—Vice-Chancellor Reed, of Camden, granted an application for a receiver for the Cape May, Delaware Bay & Sewall's Point Railroad, the applicant being the New Jersey Trust and Safe Deposit Company, as trustee for the bondholders under a $150,000 mortgage.

Americus, Ga.—Application has been made by the Brunswick & Birmingham Railroad Company for a charter. The company proposes to construct a line from Brunswick, via Montgomery, to Birmingham, and will be capitalized at $6,750,000. It is stated that the road is regarded as a certainty.

Grand Rapids, Mich.—A project is said to be on foot to build a line in Michigan along the lake shore from Saugatuck. The new company is a separate organization, but it is believed that it will have close relations with the Grand Rapids, Holland & Lake Michigan Company. The line will be built next summer.

Chattanooga, Tenn.—The route over which the Sherman County extension of the Chattanooga electric street railway line will run has been selected, and bids for material will soon be asked. The line will run over the present Harrison avenue tracks through Avondale, Stanleytown and East Chattanooga to Hills City.

Athens, O.—A company soon to be chartered will have a capital of about $1,000,000, and will be known as the Athens, Nelsonville & Hocking Valley Traction Company. It will be thirty-five miles long, and have termini in Athens and Nelsonville. The promoters of the line are H. H. Haning, of Athens, and several prominent business men of Dayton.

Cincinnati, O.—The Southern Ohio Traction Company, which owns and operates the interurban system between Cincinnati and Dayton, is contemplating an extension of its line from Dayton to Toledo. Should this plan be carried through, it would form one of the longest continued lines in the whole country. A large portion of the line is already built and some sections are building.

Orange, Cal.—The Santa Ana & Orange Motor Road has been granted a franchise for an electric line in Whittier. The road now runs only from Santa Ana to Orange and is operated by steam dummies, but under the new franchise it will be converted to an electric road and will cover a number of towns in the vicinity with a view to building up Santa Ana as a commercial centre.

Harrisburg, Pa.—Amos Hollinger, of Lancaster, Pa., is the moving power in the new Lancaster, Willow Street, Lampeter & Strasburg Railway Company, which has recently been incorporated with a capital stock of $150,000, to build a ten-mile electric line within the boundaries of Lancaster County. The new concern is said to have no connection at all with the Conestoga Electric Company or the Lancaster Railway Company.

St. Joseph, Mo.—Eastern capitalists are reported to have organized for the purpose of connecting St. Joseph and Kansas City by a new electric railroad. The road as planned will be along the east bank of the Missouri River, touching Platte City, Parkville, Dearborn, Faucett and other small towns. The construction of the line and its ultimate fate depends entirely upon the completion of the Winner bridge, which is needed to obtain entrance to Kansas City.

Los Angeles, Cal.—A new electric road has been incorporated to operate between Los Angeles and Salt Lake City, Utah, by Senator W. A. Clark and his associates. The capital stock of the company has been placed at $25,000,000, $6,000,000 of which has been paid up. When completed the road will be 1,100 miles long and will absorb the Los Angeles terminal road, which is 51 miles in length, with all its property and franchises, including 4,000 acres of land and all the wharfage in San Pedro Harbor, about 20 miles in length. This road will be taken over by the new company at a valuation of about $5,000,000.

POSSIBLE INSTALLATIONS.

Anglesmere, Pa.—Anglesmere is soon to have a new electric light plant. The building will be of brick and iron, one story high, with concrete flooring. Williamsport capital is said to be behind the scheme.

Arkadelphia, Ark.—A 50-year franchise has been granted by the city council for the installation of an electric light plant. By the terms of the franchise work must be begun within sixty days.

Shamokin, Pa.—The Shamokin & Coal Township Electric Company is soon to locate its plant here, where three sites have been looked at and favorably reported. The company expects to be ready to furnish light and power within six months.

Red Lion, Pa.—Red Lion is soon to have its electric light plant rebuilt. The Red Lion Electric Light Company is the owner and the plant is the one which was recently destroyed by fire. Machinery of the most modern type will bring the new plant thoroughly up to date.

NEW YORK NOTES.

THE AMERICAN ENGINE COMPANY, 95 Liberty street, have just shipped one of their 125 H. P. American Ball duplex compound engines to the Curacoa Electric Light plant, Curacoa, West Indies.

McCREARY'S SPECIALTY, No. 230.—This specialty is the "Turn-down" incandescent lamp. The lamp is made to fit all makes of sockets—Edison, Westinghouse or Thompson-Houston—and by a quarter turn can be turned down from 16 c. p. to 1 c. p. It is attached like any other lamp and does away entirely with regulating sockets and similar devices. The manufacturers claim that it will save 5-6 of the lighting bill and recommend it particularly for rooms, halls and sick rooms, etc. For further details, prices, samples, etc., address The A. A. McCreary Company, 136 Liberty street.

THE AMERICAN TURRET LATHE COMPANY, 133 Liberty street, have on exhibition at their salesrooms one of their 24-inch semi-automatic turret lathes. This lathe, alhough solidly constructed and considering the heavy work it will do is light in appearance. It will thread all sizes of piping, having a 3-inch hollow shaft, and tubing, piping, shafting, etc., can be finished in any desired manner; it will do all kinds of screw cutting work and at the same time cut and bore in any direction and can be used for any application required of an engine lathe.

MR. G. HOWLETT DAVIS, vice-president of the Pianophone Company, Willoughby and Raymond streets, Brooklyn, N. Y., has just received a silver medal from the U. S. Volunteer Life Saving Corps (Inland Waters) for his heroic action in saving the lives of four out of six drowning persons off Romer Shoals on September 3d. I. Wesley Jones, the president of the corps, in a letter accompanying the medal, states that the corps trusts it will be appreciated and worn with honor, and also inspire others to be ever ready for a like noble duty.

WESTON STANDARD ILLUMINATED DIAL

STATION INSTRUMENTS.



THESE INSTRUMENTS are based upon the same general principle and are just as accurate as our regular Standard Portable Direct Current Voltmeters and Ammeters, but are much larger, and the working parts are inclosed in a neatly designed dust-proof cast-iron case, which effectively shields the instruments from disturbing influences of external magnetic fields.

WESTON ELECTRICAL INSTRUMENT CO.

114-120 William St., Newark, N. J., U. S. A.

BERLIN European Weston Electrical Instrument Co., Ritterstrasse No. 89
LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI—No. 25. NEW YORK, DECEMBER 22, 1900. Whole No. 710.

The Electric Motor Applied to Elevators.



The Otis Escalator Installed at the Sixth Avenue and Twenty-Third Street Station of the Manhattan "L" Road, New York.

THE OTIS ESCALATOR.

In the illustrations are shown views of the Otis Elevator Company's escalator, installed at the Twenty-third street station of the Sixth avenue line of the Manhattan Elevated, and in the department store of Simpson, Crawford & Simpson, New York city.

The escalator is a moving staircase for use where great numbers of people are to be elevated from one level to another within a limited time. Tests have shown that one of these escalators can readily lift from seven to ten thousand people an hour. The device is as simple for the person using it as standing upon the ordinary fixed staircase.

The escalator in use at the Twenty-third street station is operated by an electric motor placed at the top and receiving its power from the street mains. The steps are wide enough to accommodate three people at once, and as the speed is seventy feet per minute nine thousand passengers can be transported within an hour.

At the top and bottom of the ascent the stairway is carried a considerable distance in a horizontal position, the steps at this point forming a level platform. This ingenious arrangement renders it easy for the passenger to enter and leave the stairway, as the step on which he stands is always in a horizontal position. To make the ascent it is merely sufficient for the passenger to stand upon any particular step and remain there, although, if he so desires, he can ascend more quickly by walking from step to step, the escalator moving with him at the same time.

The escalator has the further advantage that if the motion is arrested, by accident or otherwise, the stairs remain stationary, and it becomes to all intents and purposes an ordinary staircase, and can be used as such. It was installed at this station mainly on account of the enormous traffic of women shoppers, being in the very heart of New York's shopping district.

The escalator installed at Simpson, Crawford & Simpson's has given the same satisfaction as that installed for the Manhattan "L" road, and the Otis Company has received the contract to furnish eighteen of their electric elevators for their new building.



Upper Landing.

Visitors to the Paris Exposition had an opportunity to become acquainted with the merits of the Otis escalator, there having been one in operation there for several months. President Loubet displayed particular interest in the device and honored the company by a special visit for inspecting the new invention. The escalator received the grand prize and gold medal at the Paris Exposition.



PRACTICAL ELECTRICITY FOR EVERYBODY.

SPECIALLY PREPARED FOR STUDENTS AND ELECTRICIANS.

INCANDESCENT LIGHT AND EDISON SYSTEM.

The history of electric lighting is not very old. Its different branches have developed to such an extent that some of the heaviest investments of this country are made in electric light plants. The electric light systems of this country may be divided up into two general branches

Incandescent Lighting.
Arc "

Under the heading of the first we are prepared to consider the development and present condition of incandescent light systems.

Kinds of Lighting.—The lighting of incandescent lamps effected either by continuous or alternating current. An incandescent lamp only calls for a certain pressure and current; when these are supplied the lamps at once become normally bright and the problem of incandescent lighting, as far as the light is concerned, is complete. There are, however, certain stringent reasons for observing such limits as are imposed by circumstances, and which prevent the attainment of more than a limited light without extraordinary expense. That to which reference is made is the line circuits which carry the current, and which by their arrangement practically give the system of lighting its name. The success of incandescent lighting depends entirely upon the size, length and support of the line as well as the nature of the dynamo and its additional attachments. The most common system of incandescent lighting known is the Edison. There are in this system certain features which have made it the superior of all others. The reason for this is due to the fact that all the wiring represents a network of squares, arranged in such a manner that one point is at the same pressure practically as any other. The secret, therefore, of successful incandescent lighting is the power of retaining a uniform voltage at all points.

Basis of Lighting System.—Any wiring system which will allow a uniform pressure to prevail throughout is valuable in two respects.

(a) Lamps are saved.
(b) Light is constant.

Under the conditions mentioned the long life of a lamp is assured. There is no greater cause of breakage in lamps than the rising or fluctuating pressure in the lamps. Again, from a purely commercial standpoint, the constancy of the light is so important that unless some means are taken to keep it constant, customers cannot be retained, and the damage caused by this double difficulty becomes irreparable.

Function of the Dynamo.—To keep the pressure constant in the line the dynamo itself must preserve a uniformity of pressure, or at least within very slight variations. The line depends upon the dynamo, but by means of an ingenious arrangement the dynamo can be also made to depend upon the line. By the two affecting each other we have a system sensitive to outside changes. Compound winding enables us to retain the pressure about constant, or at least to raise or lower it when so desired. This at once brings us to a consideration of the cause of such changes.

Regulation.—The dynamo would not require any extra device if the load upon it were constant, but the continual changes affect the dynamo as follows: When the dynamo is supplying 110 volts and a load of lamps are thrown on, the pressure may fall to 105 volts, due to the

drop in line,
armature reaction,
drop in armature.

Conversely, if the dynamo is laboring under full load and the lamps to a large extent are removed, the pressure will rise from the point it is at and perhaps cause serious injury to the remaining lamps. A regulating device is therefore necessary when circumstances cause such rapid changes as these. The device used is in itself simple enough.

Compound Coil.—A rise or fall in volts is due to the conditions enumerated; a loss of volts in the armature, a loss in the line and armature reaction. These three factors pull down the voltage considerably, and their combined effect is very noticeable with each increase in the number of lights.

To compensate for this loss the dynamo is made sensitive to the changes of load in a very simple manner. A coil is wound around the magnets of the dynamo of large enough wire to carry the current of the line; when the current in the line increases the ampere turns due to this winding increase also, and the dynamo has its pressure increased because the ampere turns have strengthened the field.

If these changes are automatic the dynamo will adjust its potential to the number of lamps and always be high enough to keep them at normal candle-power. The ease with which this arrangement works is surprising; it is in popular use in every isolated as well as central station plant.

The success of incandescent lighting depends upon a wiring system that causes as little loss as possible with the greatest possible variations in current.

The Edison network is the nearest approach to perfection of anything we have. It consists in the main of three parallel webs of wire; between each two adjacent webs there is 110 volts pressure, and between the two most apart, the first and third, 220 volts. The economy of saving one wire and yet having two lighting circuits that are independent, yet in close combination, is obvious. The two outer circuits, between which there is always 220 volts, are greatly used for motors. When the same number of lamps exist on each side of the middle web of wire the system is said to be balanced. The web-like formation is due to the fact that the wire is distributed through streets, which give it the shape of a netting with square meshes, each mesh including one block.

THE LONG ISLAND AUTOMOBILE CLUB.

The Long Island Automobile Club was organized and incorporated under the laws of the State of New York, for the express purpose of fostering and encouraging social relations among members, to promote and encourage the construction and maintenance of good roads, the obtaining and upholding of whatever rights automobilists have, either as owners or users of all kinds of self-propelled vehicles; to investigate the development of motor vehicles, the giving of race meetings, parades, touring and other sporting meets incident to motor vehicles, for the general good of the sport as such, and as a pastime. The club is strictly a social club, supported by members' subscriptions. There are three classes—honorary, resident and none-resident members. Lectures have been arranged for on automobile topics, and every effort will be made to make the club rooms a center of interest to its members. Storage room has also been arranged for, where members can have their vehicles taken care of at a minimum rate. Arrangements are already completed for the care of all classes of motor vehicles. The club is located at No. 552 State street, corner of Flatbush avenue, Brooklyn. Chas. W. Spurr, Jr., is secretary.

The Electric Railway.

THE PRICE FRICTION POWER BRAKE AND THE RUGGLES ROTARY SNOW PLOW.

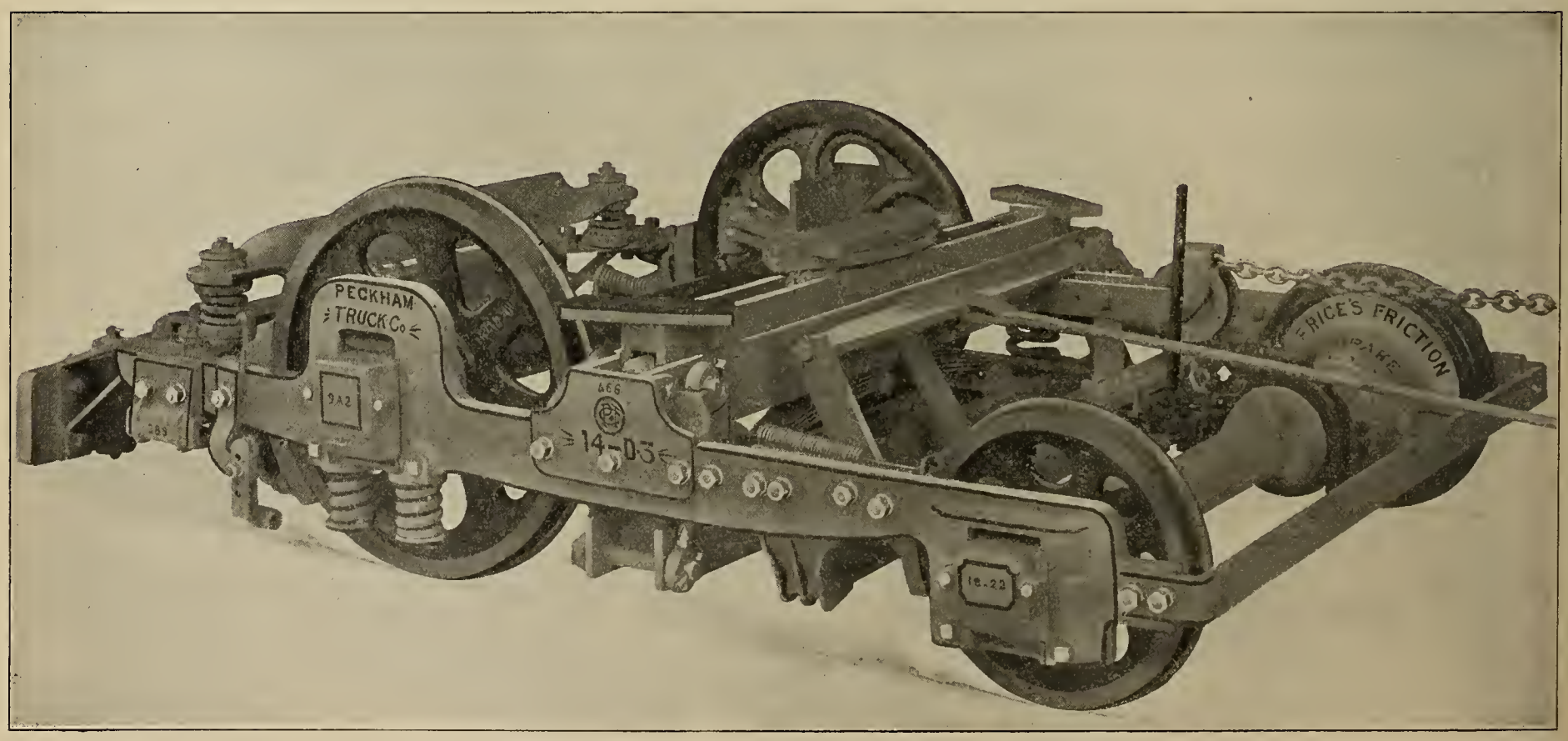
The equipment of electric cars with brakes, efficient and instantaneous in their action, has long been a problem of great importance to the operators of street railways in this country. With the air brake, after the air has been let into the cylinder, the resulting pressure on the brake shoe can only be noted by the reduction in the speed of the car. In the case of slippery rails it is impossible to tell this, this result at once completely destroying the usefulness of such a device. The same is true of the electric brake. Power is thus wasted without any adequate return, to say nothing of the danger to human lives incurred.

A brake of a somewhat different character is the momentum brake, which only utilizes the energy of the moving car. Such a brake costs nothing for power, as the energy utilized in its operation is thrown away when the car is brought to a stop. It is more efficient than any other brake because it can not only be applied instantaneously at full pressure, but also released just as quickly.

The Price friction brake allows its operation by the



New Works of the Peckham Manufacturing Company.



Peckham's "Maximum Traction" Double Truck, equipped with Price Brake.

motorman without making flat wheels. In order to make the quickest emergency stops the brake is so constructed that the motorman can feel that the brake shoe

The Electrical Age.

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NEWTON HARRISON, E. E. Editor.
Walter Mueller, Managing Editor.
ASSOCIATE EDITORS.

Electric Light and Power.
Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.

Electro-Therapeutics.
Joseph Muir, M. D.
Frederick Strange Kolle, M. D.

NEW YORK, DECEMBER 22, 1900.

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THE SLOWLY EVOLVING INCANDESCENT LAMP.

Since Edison in this country and Swan in England first turned their attention to the construction of an incandescent lamp, progress has been confined to practically the same lines as those laid down by the original inventors. The incandescent lamp has neither developed nor improved to an extent compatible with the years that have passed since its first practical introduction as a source of illumination. We mean by this that the vacuum is still necessary; the platinum terminals are still in use and the filament still retains its original carbonaceous condition, although the materials from which it was originally made have been changed.

An incandescent lamp need not necessarily be so constituted as to combine within itself the elements above mentioned. The ideal incandescent lamp does not absolutely require a vacuum, and the materials composing the filament would be better if they were not carbonaceous. The first move in the proper direction has been made by Nernst and others who favored a non-oxydizable filament. The processes now about to be followed out are largely in favor of the employment of rare oxides, ceria, thoria, etc.; in fact, the materials used in the Welsbach burner. The ideal filament is, of course, an inoxydizable one and it is therefore unnecessary to state that the vacuum would necessarily be abandoned with such filaments in common use.

The evolution of the incandescent lamp has therefore just begun as regards this line of development. Whether the invention of an incandescent lamp with an inoxydizable filament, without a vacuum and of high efficiency, will be successfully made is a question that cannot at present be answered. Such a lamp, in order to find widespread use, would certainly be free from an automatic heating device, such as is at present employed by the manufacturers of the Nernst lamp.

Ex-Mayor Strong, of New York, recently deceased, was unfortunate in the midst of his success. The failure of his firm and the recent fire that took place on the premises are but a further illustration of the old adage. "It never rains but it pours." Fire Chief Croker, according to the daily papers, in lieu of a more adequate explanation, claims that the fire was caused in all probability by defective insulation in the electric wires. This explanation is generally the most telling one and seems, as in all other cases, to be held in reserve until the very last.

Fires from electric wires might have been caused in the earlier days, when the Board of Fire Underwriters and the Fire Department had neither rules nor power to enforce other than the most ordinary precautions; but to-day, with conditions so greatly changed, fire cannot be caused by electric wires without reflecting upon the department whose business it is to make the proper inspection. Fire Chief Croker is very much mistaken, and it would require but a casual investigation to show that of all the probable causes the last to be considered was defective insulation.

In some cases the leakage of water through moulding containing electric light wires has eventually caused a smouldering fire, but only after an interval of many days and even months had passed was the insulation at all affected or did the immediate possibility of fire present itself. On the other hand, matches carelessly dropped and the inevitable cigarette are ever present causes in the best regulated establishments.

ELECTRICAL GOODS IN CALCUTTA.

Electricity as a motive power has not been used in Calcutta; but the Calcutta Tramway Company, Limited, is now preparing to change its lines from horse power to electricity, and the contract for the power station has been given to Messrs. Dick Kerr & Co., Limited, of London.

Electricity is now beginning to be extensively used in Calcutta for various purposes, such as lighting, fans to take the place of punkhas that were pulled by coolies, for driving machinery, etc., and there is an opening here for the sale of electrical machinery and goods, which American manufacturers should take advantage of.

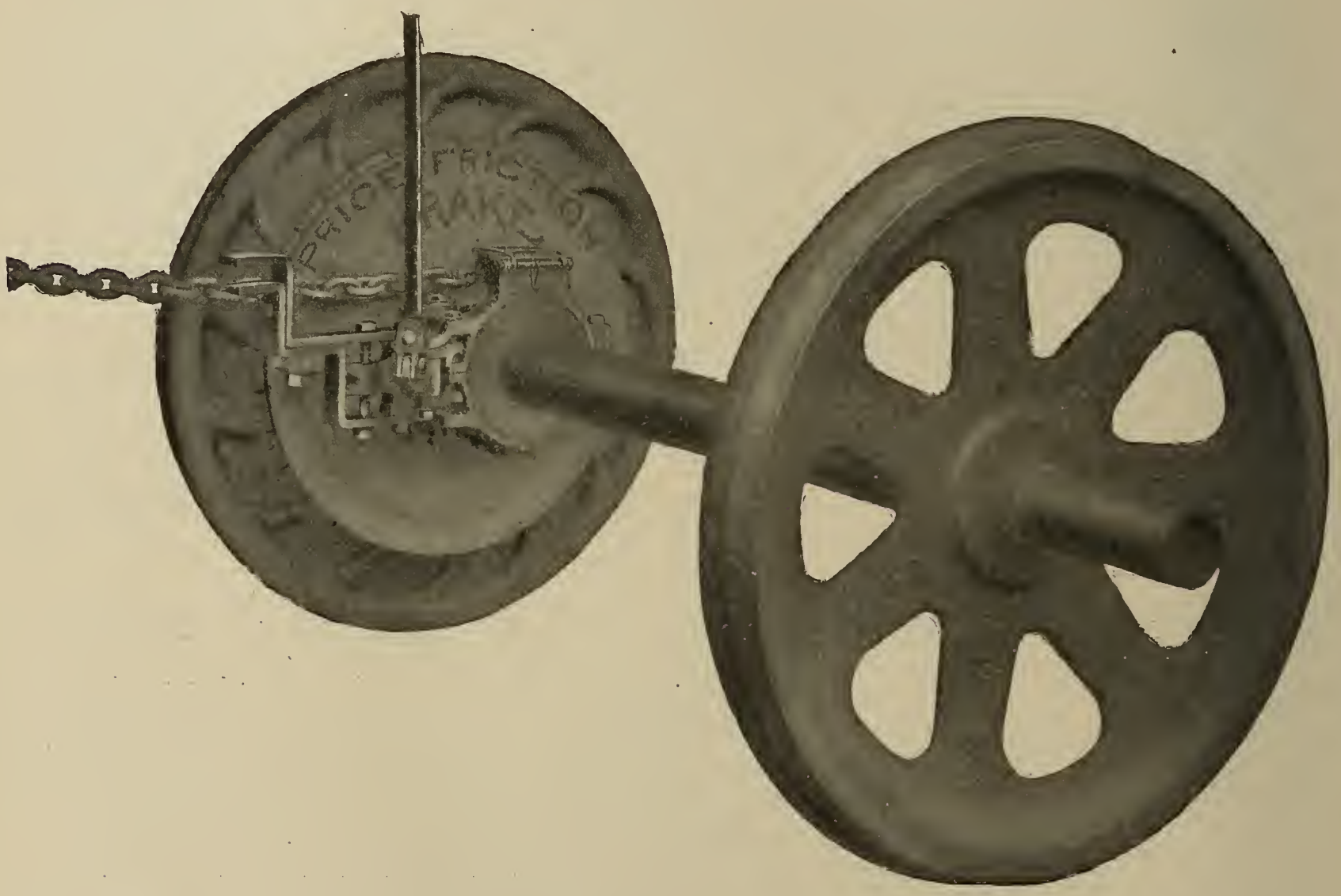
Messrs. Kilburn & Co. have an electrical plant and are furnishing electricity and electrical machinery and goods; also the following-named firms in Calcutta are dealers in such machinery and goods, viz: Osler & Co., Octavius Steel & Co., and the Calcutta General Electrical Company.

All machinery is now entered duty free in India, but there is a duty of 5 per cent. ad valorem on goods. There is a direct line of steamships between New York and Calcutta, but a cheaper freight on machinery and goods not required for immediate use would be by sailing vessels via the Cape.

pressure is on with his hand. The pressure of the brake shoes against the wheels is always in proportion to the pressure of the motorman's fingers against the operating lever. The ordinary hand brake, with which the motorman can feel what the brake shoe pressure is, is superior to the air or electric brake, although it is inferior to the friction brake in consequence of the slowness of its application and its insufficient power. As in the hand brake there is a direct leverage in the Price friction brake between the lever in the motorman's fingers and the brake shoes, but as less than one-tenth as much power is required to apply the friction brake as is necessary for the hand brake and as its handle moves less than one-twentieth the distance of the hand brake handle, the motorman is able to accurately and quickly determine the amount of pressure applied to the wheels. The friction brake applies the shoes to the wheels at full pressure an hour before the hand brake could be applied. In comparison with air brakes the stops by the Price brake were about twenty per cent. shorter than with air brakes while the tests made with electric brakes also showed results in favor of the friction power brake.

In the illustrations are shown the component parts of the Price friction power brake and its application to trucks. The brake is manufactured by the Peckham Manufacturing Company, 26 Cortlandt street, New York city.

The Ruggles "Improved" double fan rotary snow plow, shown in the illustration, represents the latest type of snow plow for use on electric roads. That the snow plow is a necessity for suburban electric railways has been proven time and time again, particularly in the Northern States where severe winters, accompanied with blizzards, are the rule. The Ruggles plow has kept



Price Friction Power Brake as applied to the Wheels and Axles.

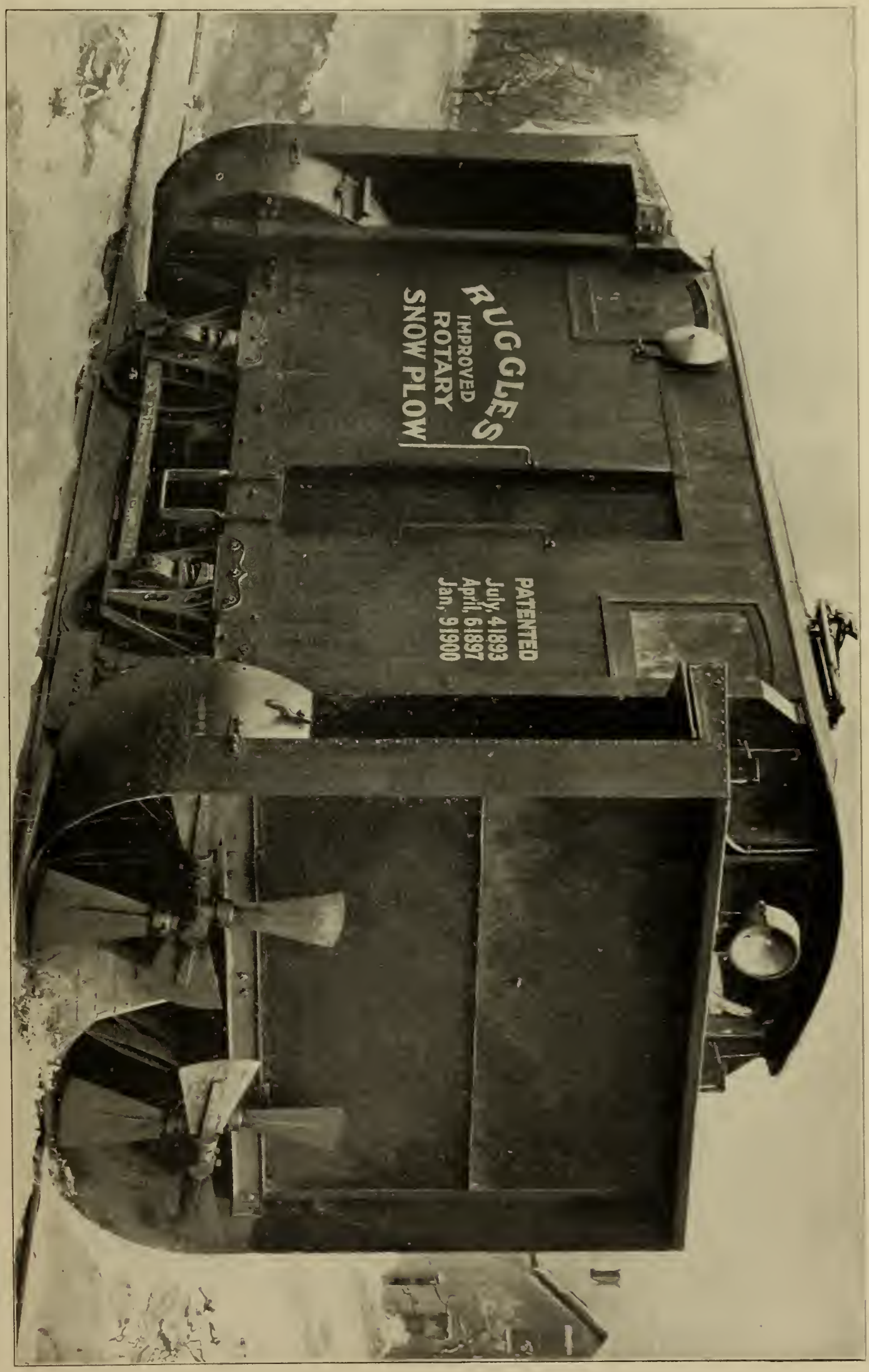
by a movement of the car of about one foot and releases them instantly.

The Price brake consists of a simple friction device placed on the car axle, to which is attached a chain connected to the sway bar of the ordinary brake rigging, as usually attached to double truck cars. Efficient means for keeping the friction surfaces free from oil, grit and water are provided. The brake can be applied to any single or double truck where there is as much as six inches of free space on the axle. The pressure on the friction surfaces required for an ordinary stop is only 2½ pounds per square inch and the wear on a car making average runs of sixteen hours a day has been shown to be less than 3/1000 of an inch per month.

In a report of tests made by George L. Fowler, M. E., he states that in comparison with the hand brake the Price brake would stop a car from a speed of ten miles roads open in winter which it had been previously impossible to operate with the aid of the ordinary push plow or sweepers used with horse cars. The Ruggles snow plow, which is constructed upon the same principles as the rotary snow plows used on steam roads, is operated by electric motors and can be moved either forward or backward. It is mounted on an electric truck to which is attached two motors of the same design and power used in operating cars. It is constructed for either single or double trucks although for long lines and in heavy snow belts the double truck plow is recommended.

The rotary fans seen in the illustration are operated by two separate electric motors which are placed inside the cab. At both ends of the cab are beveled steel knives which revolve at high speed, propelled by the motors carried inside the cab, which are attached to a longitudi-

nal shaft, provided with clutches for operating either set of knives. The knives are surrounded by steel "scoops" which run close to the rails and are the extreme width of being controlled by the adjusted top wings. In order to insure clean rails and good traction steel track scrapers and ice diggers are placed in front of the wheels. This

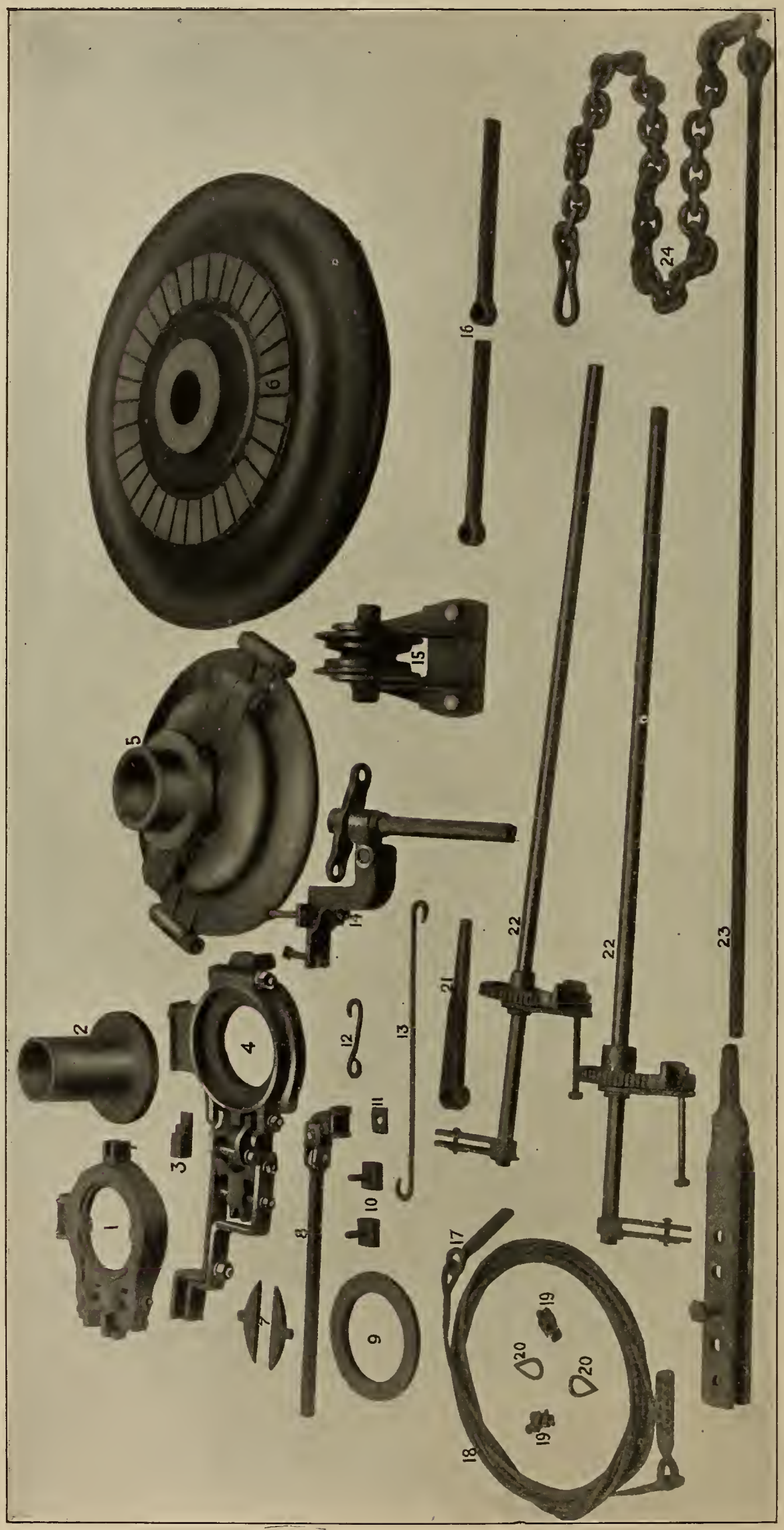


Ruggles "Improved" Double Fan Rotary Snow Plow.

the machine. The snow is received on the rapidly revolving knives and expelled laterally through chutes near their upper periphery, the direction and distance plow will remove drifts as high as the machine itself. The steel fans spread the snow evenly over the adjoining street and are kept under perfect control by the

motorman. The electric railways of Buffalo, Rochester and Niagara Falls, which are located in a heavy snow belt, have been kept open during the last four winters through the Ruggles rotary snow plow.

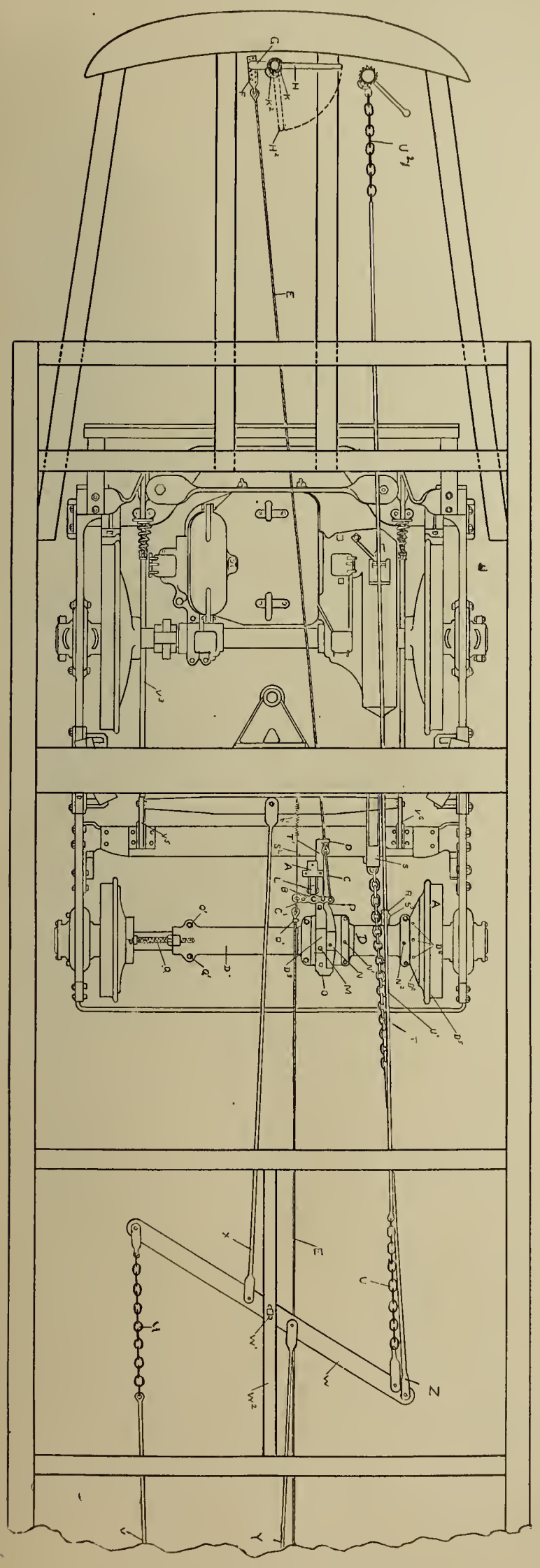
The Peckham Truck Company are the manufacturers of the Ruggles plow. A view of the works of the Peckham Manufacturing Company at Kingston, N. Y., is shown in the illustration. The following is a brief description of the same:



Parts of the Price Friction Power Brake.

New Buildings and Equipment.—The new buildings, in process of erection, are a power house, 40x65 feet; blacksmith shop, 70x120 feet; main building, 150x314

feet, and an office building, 48x48 feet, two stories high. The buildings are of brick of the mill type construction and will be equipped with the fire protective apparatus



Sketch Showing the Price Friction Power Brake Attached to Car.

required by the New England Mutual Fire Insurance Companies, by whom the property will be insured.

Power House.—The power house will contain two 125 H. P. horizontal tubular boilers; one 100 H. P. Corliss engine; one large steam air compressor; one 65 Kw. and one 90 Kw. generator; one 750-gallon Underwriters' fire pump; an electric switchboard; water and oil pumps, etc.

Blacksmith Shop.—The blacksmith shop will be fitted up with labor saving machinery, such as improved forges, oil heated forges, pneumatic riviters, power hammers, power forging machines and presses, to which will be added every facility for the economical, perfect and rapid prosecution of the work required. All gas and smoke will be drawn away from the forges by an underground exhaust system.

Machine and Assembling Shop.—The main building will be supplied with modern labor saving machinery.

An electric traveling crane will distribute the heavy material to the various tools and assemble the parts to be put together, as well as load the trucks on cars within the building for shipment. Two tracks through the center of the building will connect with switches from the West Shore and Ulster & Delaware railroads. Electricity will be used for power and light, thus saving the excessive waste of power, lost by mechanical transmission and insuring the best and most economical light. Cars of raw material will be unloaded from switches placed on either side of the stock rooms attached to the main building from which the material is supplied to the workmen as required.

The Peckham Manufacturing Company is the outgrowth of the former Peckham Motor Truck & Wheel Company; Edgar E. Peckham is the president of the company and Frank M. Jeffery is the vice-president and treasurer. The system of electric trucks owned and manufactured by the Peckham Company is the largest and most complete system in the world. It comprises trucks suitable for any and all conditions of electric railway service from a light, short 16-foot single truck car to the heaviest 45-foot Pullman car for city, suburban, trunk line or elevated passenger or freight service, and these have been adopted as standard by the largest electric railways in this country and Great Britain. In addition to the manufacture of electric trucks, the Peckham Company controls the manufacture of electric rotary snow plows and Price momentum brakes, and the new works are being constructed of sufficient capacity for the manufacture of these, and other appliances used by electric railways.

Among the Societies.

NEW YORK ELECTRICAL SOCIETY.

The 210th meeting of the New York Electrical Society was held on Dec. 12. Dr. Samuel Sheldon, professor of electrical engineering at the Brooklyn Polytechnic Institute, lectured on "Electrical Measurements of Precision." In opening his lecture Dr. Sheldon said that nearly all the measurements carried out in the practice of the electrical engineering profession are made with an accuracy which entitles them to the name of measurements of precision. However, they permit of classification into two groups, viz., commercial measurements and measurements of precision. Commercial measurements are made with only such a degree of accuracy as is required by commercial conditions, while every possible refinement is employed in the making of measurements of precision. Commercial determinations, e. g., of hysteretic constants of dielectric strength, and of insulation resistance permit of errors of 10 per cent. of 2 per cent., of 20 per cent. and of 25 per cent. respectively. Comparisons of standard resistances, of standard cells, of standard current and e. m. f. meters must be made

with the greatest possible accuracy, errors greater than 1-100 per cent. being often unacceptable.

Of the measurements of precision which occur in practice nearly all are comparisons with standards and not absolute measurements which depend ultimately upon the standards of length, mass and time.

The use of the tangent galvanometer, which was so common a few years ago, has now almost entirely ceased. The instrument itself was burdened with a multitude of correction factors—many of them being of uncertain magnitude.

The standard cell, on the other hand, has come into scientific favor. The Clark cell, although officially standard, has a high temperature coefficient, and, under rising temperature, has a time lag due to the slowness of the processes of diffusion and solution. The Carhart cell is convenient to use, and has but half as great a temperature coefficient. The cadmium cell is of almost negligible temperature coefficient, but has an uncertain e. m. f. for temperatures below, say, 12 degs. C.

The best of modern standard resistances are made of manganin, which besides having a very small temperature coefficient gives very small thermal e. m. f.'s in combination with copper. Nearly all the alloys of nickel and iron have small temperature coefficients, but give a large thermal e. m. f. with copper.

The galvanometers used in measurements of precision are either of the Thomson or of the d'Arsonval type. The former can be made to deflect 1 mm. at a meter's scale distance for an impressed potential difference of 1-100 of a micro-volt. The best of the latter require one microvolt.

The precise comparison of nearly equal resistances is accomplished by means of the Carey-Foster bridge—comparison between two standard resistances, one of which is nominally ten times the size of the other, can be made by means of three nearly equal auxiliary resistances. Another method makes use of an auxiliary box of five resistances having nominal values of 1, 1, 2, 3 and 4 times the resistance of the smaller standard. By means of the Carey-Foster bridge these resistances are compared with the smaller standard and with each other in combination. The larger standard is then compared with them in series.

Low resistance standards may be compared by means of the Thomson double bridge, providing the ratio of the resistances around the contact between the low resistances be adjusted simultaneously with the resistance in the main ratio arms. There may be a distortion of the flow lines in the low resistances.

All e. m. f.'s are best compared by means of some form of potentiometer.

Currents are measured by sending them through low resistances supplied with side potential terminals. The potential difference between these terminals is measured by means of the potentiometer.

After Dr. Sheldon's lecture, President Martin exhibited some 40 to 50 slides, chiefly night views, illustrative of lighting effects of the Paris Exposition. The day and night aspects of the same scenes were shown, and a great variety of details were given in regard to the manner in which the effects were secured. These Paris views were compared critically with a number relative to the same kind of work at Chicago, Atlanta and Omaha, and the different methods taken to obtain the same results were pointed out.

The following resolution was unanimously adopted:

Whereas, It is proposed to establish a national standardizing bureau, and

Whereas, Such a bureau would be of the greatest value and benefit to electrical science and industry in the United States, and assist in the further development of export electrical trade, be it

Resolved, That the New York Electrical Society hereby expresses its approval of the legislation in furtherance of such an object, and

Resolved, That the society associate itself with kindred bodies to secure the establishment of the bureau.

The following gentlemen were elected to membership: Edwin Rust Douglas and Rumsay N. Scott.

DESTRUCTION OF THE PLANTS OF THE BROWN HOISTING & MACHINERY COMPANY AND THE ELWELL-PARKER ELECTRIC COMPANY OF CLEVELAND, OHIO, BY FIRE.

Fire entailing a loss of $400,000 and throwing 1,200 men out of employment practically destroyed the entire plant of the Brown Hoisting & Machinery Company on December 17th.

The fire originated in the shop of the Elwell-Parker Electric Company, which occupies a part of the Brown Building. An employe went into the paint room with a lighted candle. An explosion quickly followed, and the flames spread with lightning rapidity. Fifty employes of the Elwell-Parker Company had to run for their lives. Through the Brown Company's erecting room, plate shop, blacksmith shop, and shipping department the fire swept, driving the workmen out in haste.

The firm's office building, a four-story brick structure, was hemmed in on three sides by blazing shops, but the fire department managed to save it, with its valuable plans and blue prints. By hard work the pattern room was also saved, and this will materially aid the firm in getting ready for business again.

Within two hours after the alarm of fire the officers of the Brown Company were figuring with contractors for the erection of new buildings. It is expected that they will be completed within four months. The Brown Company's plant was one of the largest manufacturing institutions in the city. The firm has several contracts for government work and for foreign delivery. Among the machinery wrecked is a big order for the new Carnegie plant at Rankin, Penn., which was all ready for shipment. Where possible, contracts will be turned over to other firms for completion.

President Fayette Brown estimates the company's loss at $400,000. It is fully covered by insurance, distributed among sixty companies. The Elwell-Parker Company lost $25,000, and has adequate insurance.

"JUDGE'S" COMPLIMENT TO THE NEW YORK CENTRAL.

In the issue of Judge for December 8, 1900, which issue was No. 999, a delicate compliment was paid to the New York Central and its famous "Empire State Express" and the engine that took the gold medal at the World's Fair in Chicago, by putting a train of cars at the top of the title page with the words "Number Nine Ninety-nine" upon it.

It seems fitting in these days of the expansion of American commerce to compliment the New York Central which has done so much in this direction. Its passenger trains, especially its great trains like the "Empire State Express," the "Exposition Flyer," the "Lake Shore Limited" and the "Pan-American Express" have all been in the nature of general advertisements of what American genius and American mechanics, backed by American capital, can do, and the result of this advertising is felt in every manufacturing establishment, in every mine, in every forest, and in every field in the United States, for the products of all these have been carried to the ends of the earth by the great transportation companies of America, of which the New York Central is one of the most prominent.

Patents.

WEEKLY ELECTRICAL PATENT RECORD.
PATENTS ISSUED DECEMBER 4, 1900.

Conducted by Otto Greenberg. Complete descriptions and drawings of any patent mentioned below will be sent on receipt of five cents.

662,911. Electric heater; J. E. Brown, Philadelphia, Pa.

662,913. Elevator: J. Bush, London, England.

662,921. Apparatus for electric traction; H. Dolter, Paris, France.

662,928. Space-block for armatures; H. Geisenhoner, Schenectady, N. Y.

662,937. Electric arc lamp; F. A. Gilbert, Brookline, Mass.

662,979. Automatic magnetic circuit-breaker; W. M. Scott, Philadelphia.

662,984. Telephone-exchange system; A. Stromberg, Chicago, Ill.

662,985. Telephone-transmitter; A. Stromberg, Chicago, Ill.

662,986. Telephone-exchange system and apparatus; A. Stromberg, Chicago, Ill.

662,987. Circuit-protector; A. Stromberg, Chicago, Ill.

662,988. Telephone-exchange system; A. Stromberg, Chicago, Ill.

662,992. Electric current indicator; H. M. Warren, Schenectady, N. Y.

662,995. Electric arc lamp; O. N. Wiswell, Lynn, Mass.

662,996. Electric arc lamp; J. J. Wood, Fort Wayne, Ind.

663,015. Electric meter; T. A. Edison, Llewellyn Park, N. J.

663,035. Apparatus for disconnecting machinery; A. Maul, Dresden, Germany.

663,043. Return-signal device for call-boxes; J. S. Robinson, Chicago, Ill.

663,059. Automatic electrical apparatus for indicating leaks in ships; W. W. Zeorikin, Moscow, Russia.

663,075. Space-block for armatures; H. Geisenhoner, Schenectady, N. Y.

663,082. Fire-alarm telegraph apparatus; W. H. Kirnan, Bayonne, N. J.

663,095. Incandescent body for electric glow-lamps; A. Just, Vienna, Austria.

663,130. Electrical apparatus for controlling signals or other circuits; H. A. Parrish, Jackson, Mich.

663,196. Telephone receiver; C. H. North, Cleveland, Ohio.

663,207. Means for starting or stopping electric motors; J. J. Wood, Fort Wayne, Ind.

663,209. Knife switch; J. A. Wright, Irwin, Pa.

663,216. Railway telephone system; E. E. Carpenter, Worcester, Mass.

663,217. Ceiling cutout; W. A. Church, Pittsburg, Pa.

663,232. Switch for electric railways; W. Kingsland, London, England.

663,233. Connection of strikers to motor-vehicles for mechanically operating electric switches; W. Kingsland, London, England.

663,289. Dry battery; Ernest Meyer, Paris, France.

663,304. Magnetic separator; F. Theilengerdes, Memphis, Tenn.

663,346. Electric arc lamp; Walter C. Johnson and A. Wunderlich, London, England.

663,376. Electrical railway signaling system; Louis C. Werner, Louisville, Ky.

663,388. Electric igniter for explosive engines; M. S Napier, London, England.

663,400.. Method of controlling mechanism by means of electric or electromagnetic waves of high frequency; Ernest Wilson and Charles J. Evans, London, England.

PATENTS ISSUED DECEMBER 11, 1900.

663,412. Telephone system; Wm. Bennett, Mesquite, Tex.

663,419. Thermostat; Harvey Cortland, Pittsburg, Pa. This invention consists of an expansible and contractable disk for thermostats of fiber vulcanized at substantially 350 degrees Fahrenheit.

663,454. Electric-arc lamp; F. W. Martin and Frank Stewart, Hamilton, Canada.

663,489 and 663,499. Electric connection; Wm. B. Cleveland, Cleveland, Ohio.

663,491. Controller for electric motors; Chas. A. Dresser, Chicago, Ill.

663,496. Electric Switch; Edward M. Hewlett, Schenectady, N. Y.

663,524. Incandescent lamps; Samuel D. Washburn, Boston, Mass.

663,600. Electric R. R.; Theophilus P. Chandler, Philadelphia, Pa.

663,609. Dynamo or motor; Geo. L. Martin, N. Y.

663,612. Circuit-changer; Eustice Oxley, Lynn, Mass.

663,625. Electric R. R.; Marco T. de Felice, Rome, Italy.

663,659. System of electrical distribution; Henry R. Kent, N. Y.

663,695. Electric interrupter; James M. Davidson, London, Eng..

663,698. Electric-arc lamp; Josef H. Hallberg, Peabody, Mass.

663,781. Circuit-breaker; Geo. W. Parsons, La Grange, Ill.

663,783. Selective-signal system; Frank A. Pickernell, Newark, N. J.

Business News.

NEW INCORPORATIONS.

Harrisburg, Pa.—The Mayfield Electric Light, Heat and Power Company has been capitalized and chartered for $5,000.

Nashville, Tenn.—Among recent incorporations in Tennessee is that of the Bristol Light and Power Company, which has received a charter and is capitalized at $25,000

Marion, Ind.—The Mead Electric Company has been organized by Messrs. Mead and Keller, of Marion, with a capital stock of $100,000, to supply electricity for heat, light and power.

Springfield, Ill.—The American Battery Compound Company, of Chicago, has been organized with a capital stock of $2,500. Its incorporators are all Chicago parties.

Newark, N. J.—The American Steel Railway Generating and Power Company has been incorporated, at Trenton, for $2,500,000 to carry on the business of electrical and mechanical engineers, manufacture and deal in electricity for motive power, heat and light.

Des Moines, Iowa.—A charter has been granted to the Dyersville Light and Water Company, which is capitalized at $15,000, and an amendment to its articles has been field by the Des Moines Edison Lighting Company, certifying to an increase of its capital stock from $450,000 to $1,250,000.

DeKalb, Ind.—A change in its name has been instituted by the Sycamore & DeKalb Electric Railway Company, which will continue its operations under the name of the DeKalb County Light, Heat and Traction Company. Its main offices will be changed from Sycamore to DeKalb and two additional directors put on its board, bringing the number up to five.

Tecumseh, Okla. Ter.—A new corporation, with a capital stock of $1,000,000, to be known as the Oklahoma Telephone and Railway Company, has recently been granted a charter and intends to build an electric line from Tecumseh to Coalgate, I. T., passing through Pauls Valley, Roff and Stonewall. Another line will be run from near Pauls Valley to Sulphur, where the line divides and runs west to Davis, terminating at Hickory, both in the Indian Territory. The estimated length of both lines will be 125 miles, and will cost about $100,00. In connection with the traction system the company will operate an electric light plant for each road and illuminate all the towns on its lines.

TELEPHONE CALLS.

Pierre, S. D.—The Tyndall Telephone Company was incorporated, on November 29, by local capitalists for $2,500.

Richmond, Va.—A $200,000 company will soon be organized in Norfolk by D. R. Creecy and others to promote a telephone system.

Columbus, Ohio.—The Harrison Telephone Company, of Hamilton County, has been incorporated by local interests with $5,000 capital.

Jefferson City, Mo.—Among recent incorporations is that of the Cass County Telephone Company, of Harrisonville. The capital stock of the new corporation is $2,000.

Nashville, Tenn.—A charter has been granted to the Citizens' Telephone and Construction Company, which has been organized with $10,000 capital stock.

Huntington, Pa.—The Huntington & Clearfield Telephone Company has been chartered with a capital of $1,000, and will build a telephone line through seven counties of the State.

Sheridan, Ind.—The Central Indiana Telephone Company, of this city, was incorporated, on November 21, at Indianapolis, for $10,000, to erect and operate telephone lines.

South Whitley, Ind.—A company which will operate a telephone exchange has been incorporated recently under the name of the South Whitley Telephone Company with a capital of $3,000, by local merchants.

Wilmington, Del.—On November 23 a charter was issued to the Philadelphia Messenger Telephone Call Company, granting it the privilege of using electricity in all its branches. The capital stock is $100,000..

Albion, Ind.—A telephone company, to be known as the Noble County Telephone Company, has been incorporated in Indianapolis for the purpose of operating a telephone exchange Its capital is $15,000, subscribed entirely by local interests.

St. Paul, Minn.—Among the charters granted by the secretary of state, on November 26, was that of the Ada Telephone Company, whose object is to operate telephone lines. Its capital is $1,000, and the incorporators are from Ada, Gary, and Twin Valley.

Columbus, Ohio.—Charters were granted, on November 26, to the National District Telephone Company, capitalized with $1,000, to construct a telephone system, and the Citizens' Telephone Company, of Xenia, organized for the same purpose, with a capital of $125,000.

STREET RAILWAY NEWS.

Erie, Pa.—Articles of incorporation have been granted to the Terminal Street Railway Company, with a capital of $7,500, to build a trolley line in Erie one and one-quarter miles long.

Easton, Pa.—Articles of association have been filed at the Easton court house for the Bangor, East Bangor & Portland Street Railway Company, with a capital stock of $12,000.

Boston, Mass.—The consolidation of the Brockton, Plymouth, Pembroke, and the Plymouth & Kingston Street Railway companies is now complete, the present capitalization being $270,000.

Chesapeake City, Md.—It is reported that $80,000 of the $150,000 capital stock of the Cherry Hill, Elkton & Chesapeake City Electric Railway Company has been subscribed in a lump sum by Philadelphia capitalists.

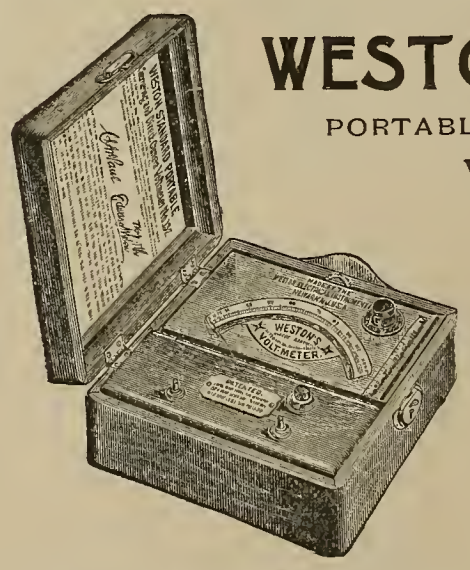
Fort Wayne, Ind.—The Indiana & Ohio Traction Company has been organized and incorporated with a capital of $750,000 by Indiana, Ohio and Pennsylvania capitalists. It will construct and operate electric lines within the two States mentioned.

Youngstown, Ohio.—An increase of $4,000,000 to the capital stock of the Youngstown & Sharon Electric Railway Company was voted by the stockholders on November 20. This increases the capital of the company to $6,000,000. New York capital is said to be heavily interested.

Hocking Valley, O.—Articles of incorporation have been granted to the Athens, Marietta & Hocking Valley Traction Company, which has been incorporated for $100,000; and will build an electric line from Athens to Logan, through Athens and Hocking counties. Light, heat and power will also be furnished.

Patchogue, L. I.—Twenty of the citizens of this town are said to have agreed to purchase the rights, title and interests of the Patchogue & Port Jefferson Traction Company, which was formed some time ago to build an electric railroad across the island between intermediate towns. The purchasers will endeavor to effect the construction of the road.

Philadelphia, Pa.—The lease of the properties of the Easton Consolidated Electric Company was ratified on November 30, in Camden, N. J., the lease providing for an annual rental of $45,000, which is equivalent to 10 per cent. of the amount paid in on the stock of the Easton Consolidated, which will be practically $15 a share after the final call has been made.



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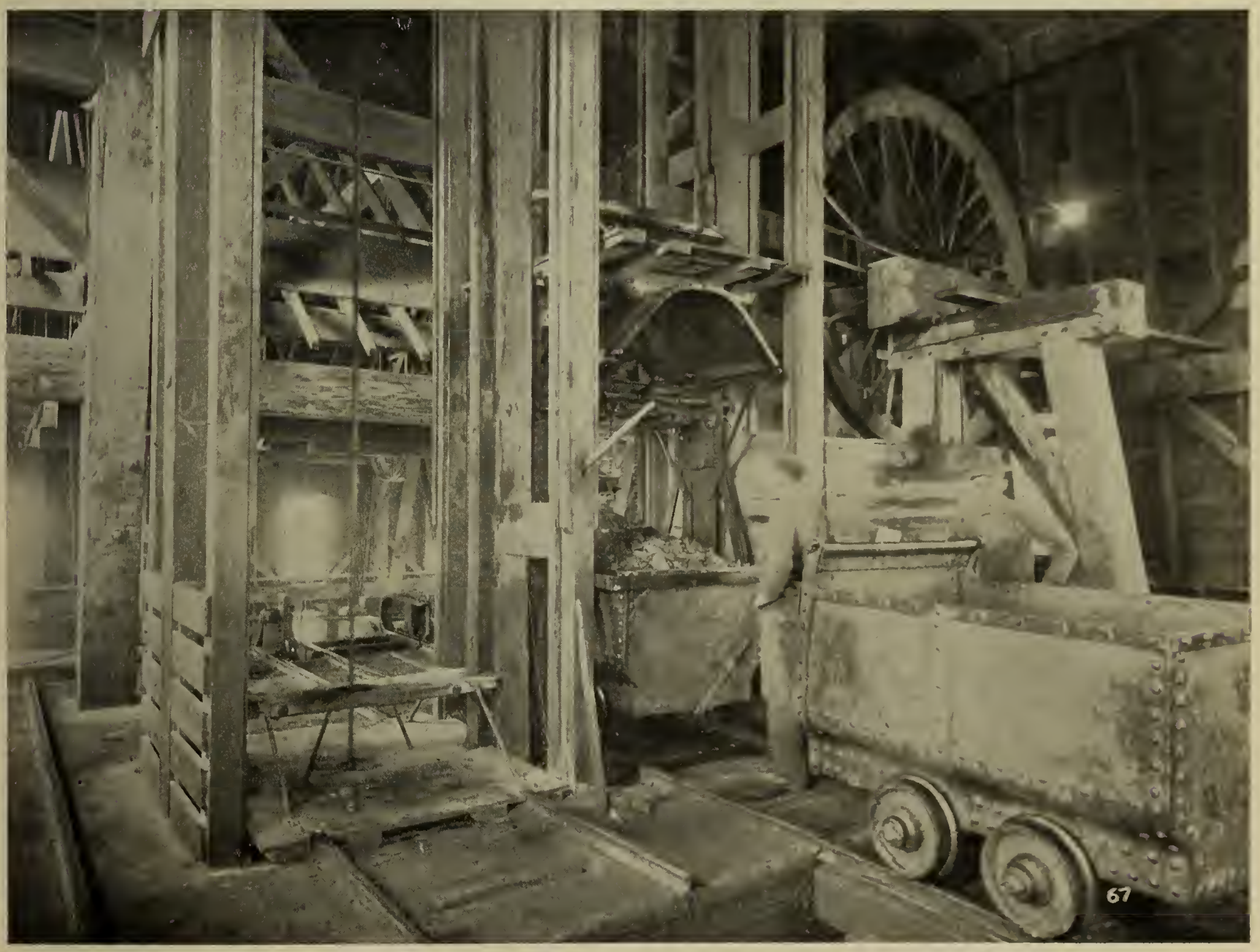
BERLIN. European Weston Electrical Instrument Co., Ritterstrasse No. 89

LONDON. Elliott Brothers No. 101 St. Martins Lane.

The Electrical Age.

Vol. XXVI.—No. 26. NEW YORK, DECEMBER 29, 1900. Whole No. 711.

Electricity Applied to Mining.



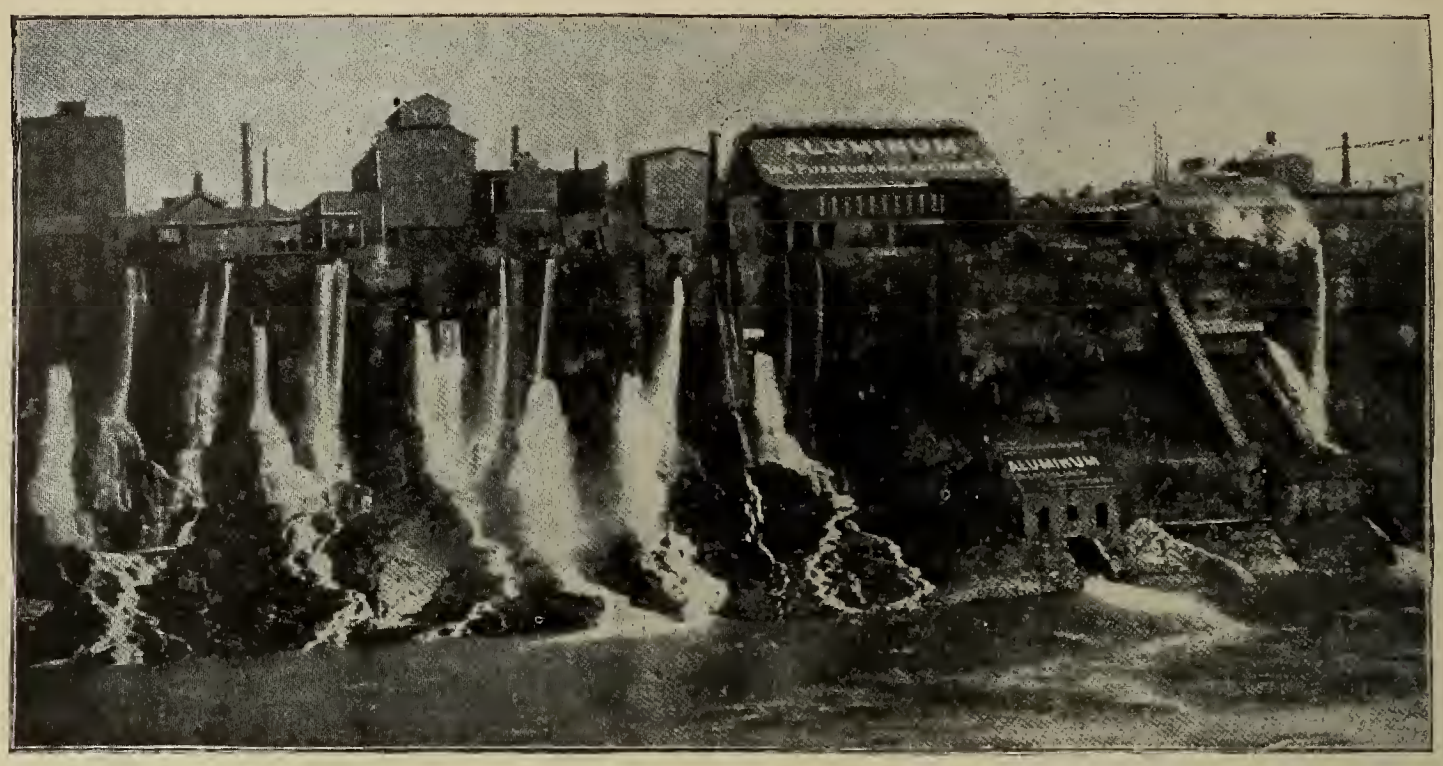
One of the Shaft Houses in the Tamarack Copper Mine.

LONG DISTANCE TRANSMISSION FOR LIGHTING AND POWER.

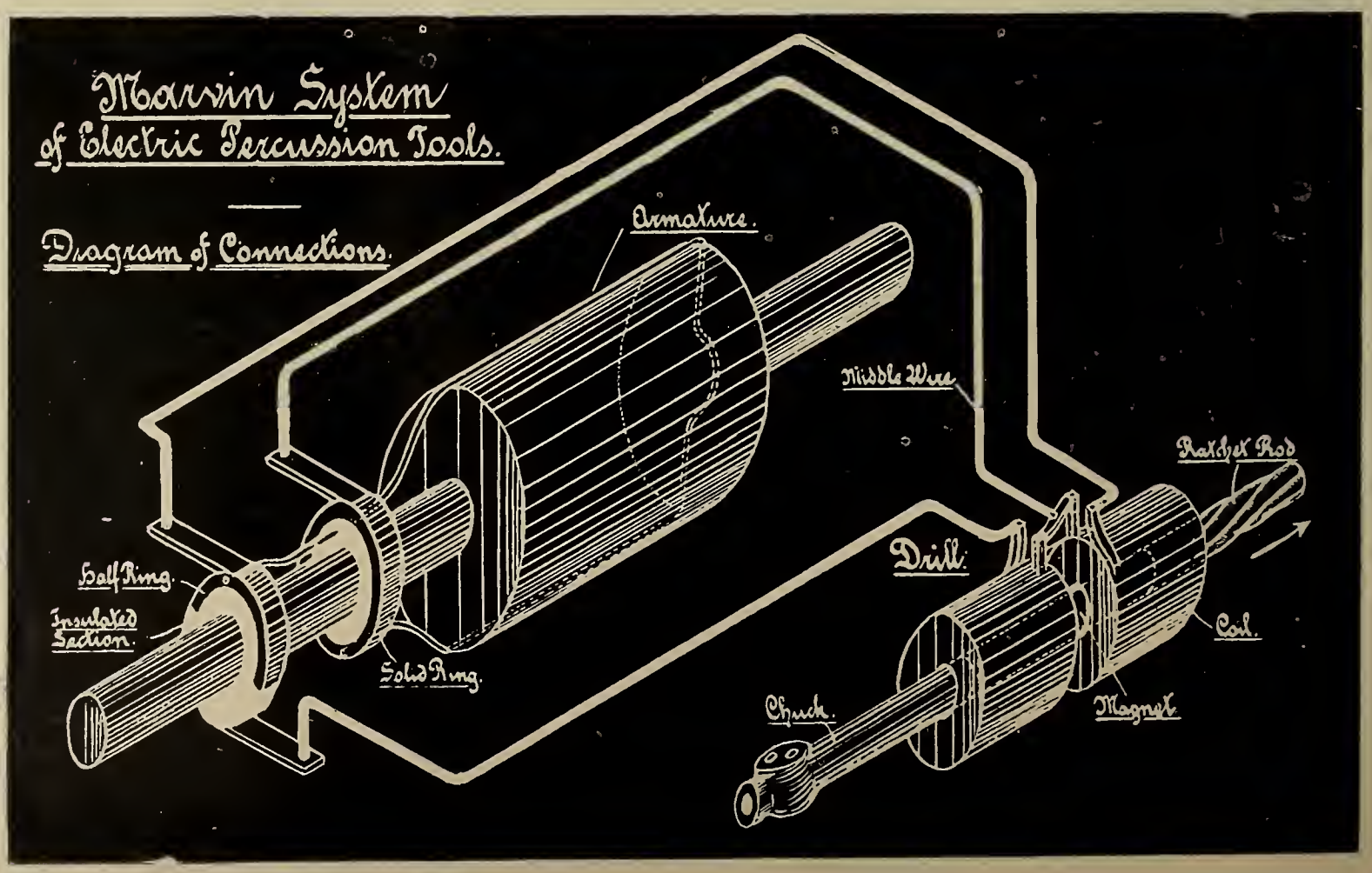
The test of practical operation in long distance transmission has been applied in but few cases and the severe test of continued operation over a considerable length of time is of rare occurrence. The latter is the crucial test and its commercial significance gives it the highest importance. The continued and successful operation of one plant for a year under extreme conditions of situation and service is of higher value in testimony to the practical development and possibilities of electrical work than many elaborate projects for the operation of novel apparatus for a short time. It is with this idea in mind that a description of a general character is given of a plant, or at least of the elements of one for transmission of power. The conditions which have been met include a very considerable distance, extreme difficulties of climate and roughness of country, exacting requirements in continuity of service ,etc. The power employed in a long distance transmission plant is applied to mining and illustrations are shown of the interiors of the Tamarack copper mine. The methods of handling the ore and

some of the machinery employed is also indicated. The heaviest service is met with in connection with mining and many precautions must be observed, not only with respect to the power employed and the machinery generating the current but the design of the drills. Possibly the science of drill construction is as important as many of the features connected with the erection of the plant and the application of the power.

According to Harry N. Marvin, in an article entitled "The Electric Percussion Drill in Theory and Practise," the following statements are interesting: "Wherever rock is to be excavated in mining, tunnelling or quarrying, there of necessity we find the percussion drill. Some years ago two types of drills held the field, the hand drill and the direct acting air or steam drill. With the extension of electrical methods of power transmission to mining operations came the urgent demand for an electrically operated percussion drill. The mechanical and



The "Money Making Cliff" at Niagara Falls.



Details of the Marvin Percussion Drill.

electrical requirements of this machine are particularly severe. It is called upon to continuously endure a practically uncushioned reciprocation and a blow upon substances harder than cast iron. The general requirements of an electrical percussion drill for mining work are that it shall be light enough to be quickly handled by two or three men. It must be powerful enough to compete with an air drill that absorbs eight or ten horse power. It must be so simple in its design that it can readily be repaired by an ordinary mechanic without electrical experience. It must be so constructed that the complete machine and its several parts can be soaked in mud and water without injury. It should be incapable of burning out and the materials employed should be as little subject to crystallization as possible." These, in brief, are some of the requirements which make the Marvin outlines necessary in the construction of electric drills of the percussion type and his opinion is based upon sound practical experience.



Tramming in a Lower Level in the Tamarack Copper Mine.

The transmission plant, on the other hand, supplies the power with which devices of this kind are operated. In the case of the Telluride plant, in Colorado, the Gold King mill receives power from the same for operating its crushers and stamps. A few miles from the mill there is a water power but the country between the two points is steep and rough and for many months during the year is covered with snow. Electricity is the one means of getting power from its source to the mill. The current is carried over a line of bare wire to the mill three miles away and the same general plan is observed in this case as in many others in the West. In copper mining electricity finds a special application for refining. Its use is absolutely necessary and for drilling and excavating it is economical and convenient. With water power as a basis for cheap electricity and the employment of a high tension system, the delivery of the power can be readily regulated by the rules of ordinary practise. In the Tamarack copper mine success has been met in this direction and in this case as well as many others the earning capacity of the mine is largely dependent upon the administration of affairs with reference to the employment of electricity. Water power plants are growing institutions in the United States and the great appreciation shown by manufacturers can best be witnessed at Niagara Falls, where many industries succeed through the use of cheap power. A view of the "Money Making Cliff," with its issuing streams of water, is shown; each stream representing a transmission plant of the most modern type. A knowledge of the principles underlying power transmission is fundamentally necessary before the severe conditions met with in practise can be properly appreciated. Power transmission fails to be successful when such considerations are neglected. On the other hand, a practical knowledge of all the difficulties is bound to shape the methods and means employed to best suit the end in view.

The Electric Railway.

ELECTRIC TRAMWAYS IN BARCELONA AND VICINITY.

By Julius G. Lay, U. S. Consul-General, Barcelona, Spain.

I transmit the following particulars regarding the progress made toward completing roads already in course of construction, and what has been accomplished in organizing companies and obtaining concessions and franchises for projected roads, as well as those to be changed from horse and steam to electric traction. In as many cases as I have been able to obtain them, the names of the chief contractors or persons who are likely to have charge of the purchase of construction material and equipment are given.

(1) Compania Anonima; owned entirely in England; completed and running through the principal streets of Barcelona with a double track of about 25 miles. The chief contractors were Messrs. Dick,Kerr & Co., of England. The trolley wire, trucks, electrical machinery, engines, and motors all came from the United States.

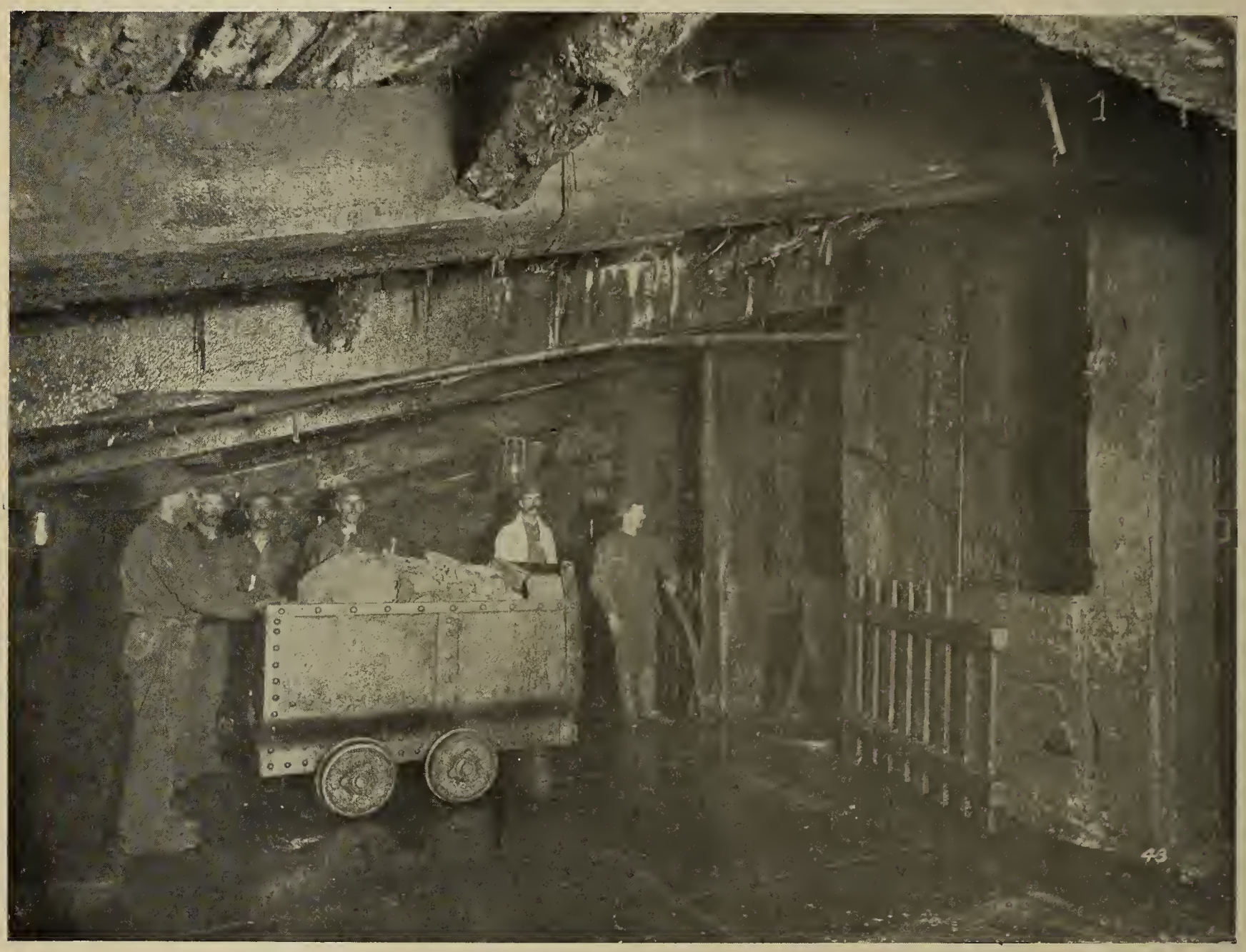
(2) Ensanche line (not named). This line now runs horse cars, and is owned by another English company, although the directors are those of the Compania Anonima, in conjunction with which it will be operated and connected. The plans and specifications are now being prepared to change the present system of horse traction to electric, and probably the same firm—Dick, Kerr & Co.—will be its chief contractors. This road will be about 4 miles in length, and, although single track, the wirework necessary will be as much as if for a double track.

(3) Barcelona-Horta Extensiones; will run from outskirts of Barcelona to town of Horta, 8 miles distant, with a single line. This road is about half completed. The contracts all are let.

(4) Barcelona and San Andres. This line, at present steam, is to be changed to electric very soon, as permission for the change has been granted by the Spanish authorities. The same company as the Barcelona-Horta line owns this one, with 5½ miles of double track. No contracts for building this line have yet been let, but information regarding them may be obtained from the Societe Anonyme d'Enterprise de Travaux, Liege, Belgium. This company will also build an electric tramway from San Andres to Horta, a distance of 2½ miles.

(5) Barcelona to Badalona via St. Martin; now steam; 10 miles; G. H. Gillis, manager. Nothing has been done towards any change, but the power house now under construction for the Barcelona-Horta Extensiones is being built to furnish power to the three last-named lines.

(6) Compania General de Tranvias. The present Ger-



Plat on the Sixteenth Level in the Tamarack Copper Mine.

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NEWTON HARRISON, E. E. Editor.
Walter Mueller, Managing Editor.
ASSOCIATE EDITORS.
Electric Light and Power.
Alfred E. Wiener, E. E.
Osborne P. Loomis, E. E.
Electro-Therapeutics.
Joseph Muir, M. D.
Frederick Strange Kolle, M. D.

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THE COMING EXPOSITION AT BUFFALO.

Were an historian of the future to attempt to write an accurate record of the progress made in the arts and sciences and its influence upon the nation's advancement, a record of this kind could best be made through a citation of the various expositions, their scope and success. The Pan-American Exposition, to be held at Buffalo, will mark a decided advance in the progress of American civilization. It will cover an immense field of work, and successful industries, representing the labor of thousands of workers, will be shown in the form of exhibits. Not the least important of these will be those of electricity and electrical appliances. No exhibit could be more interesting to-day than that which would display in its entirety the various applications of electricity for light, heat and power. The introduction of this new force into the household, the factory and the mine has greatly added to the list of devices employing this form of energy.

One of the most noticeable characteristics of the twentieth century will be the universal employment of electrical devices to a great percentage of the requirements of life. At the Pan-American Exposition the electrical exhibits will be more heterogeneous in their character than even those given at the Chicago Exposition. Since that time many new industries have cropped up and electric power is used to three times the extent as heretofore. If the anticipations of the American public are but half way realized the coming exposition will be an unqualified success and add greatly to the industrial prominence the manufacturing interests of the United States have gained for her. The next century will leave less time than this for retrospective views and much is expected from those engaged in lighting, power and transmission enterprises.

WIND POWER FOR ELECTRIC LIGHTING.

The forces of nature have been utilized to a greater extent in the last half century than since the first Chinese mechanics constructed their primitive water wheels. Wave motors and tide motors have been constructed to perform practical duties in the way of generating current for light and power and the water falls of the United States and Europe are likewise used for purposes of the same description; but wind power has not been extensively employed, although it seems to be the most universal form of power and the easiest to take advantage of. In Europe, however, experiments have been successfully made with a windmill of ingenious construction, as the most important element of the plant. At the entrance of one of the fjords on the Baltic a wind power plant has been erected by C. P. Neumann, of Wittkiel. This motor develops over thirty horse power and a speed of about eleven revolutions a minute. The control of the speed is effected by means of an automatic device controlling the angle of the vanes. When the wind blows very strongly the surface which they oppose to it are reduced and the reverse when the wind blows lightly. The electrical end of this plant consists of a shunt wound dynamo, running at about seven hundred revolutions a minute, generating one hundred and twenty amperes at one hundred and sixty volts when the speed of eight feet per second is attained by the wind. The remarkable fact in connection with this installation well worth noting is the lack of personal care required. A storage battery plant receives the current from the generator and it feeds the lamps and motors from the circuit. The town of Wittkiel will depend entirely upon wind power plants of this description for its light and power, and judging from the success of this present installation, the town will get its power very cheaply indeed.

Mr. Charles S. Brush, the arc light expert and well known inventor, was one of the first in the United States to build an up-to-date wind power plant. He made use of practically the same devices as those employed by Mr. Neumann. He built a tower and used a windmill with adjustable vanes, controlled automatically by the dynamo. When the wind blew very strongly the electromotive force of the dynamo tended to increase: with a fixed resistance the current was increased and the vanes of the windmill were so changed in their angle that the speed of the prime mover remained practically uniform. Of course, in installations of this description storage batteries are inevitable, but there is no reason why their use should entail any considerable loss of efficiency. To begin with the power is obtained for nothing and the cost of the windmill and dynamo is not too great to defeat any commercial object which may be kept in view. Even though a plant of this description costs more to construct than one composed merely of engine and dynamo it is very likely that it can be run at a profit, provided the wind can be relied upon to blow with a certain degree of average velocity during the year. In other cases than where the conditions are as we have briefly outlined them the employment of a large battery of storage cells would be absolutely necessary and this, of course, is an investment and an expense that must involve a large outlay. There is no doubt that in many instances wind power plants can be installed in such a manner that the power may be sold with a profit but meteorological conditions will govern the situation in every case and are the first to be considered.

man company has purchased franchises and concessions of the former owners, and the change from steam to electricity should soon be made, as the permanent way has been relaid for 5½ miles. Contracts for cars and equipment have not as yet been let. Details of same may be obtained from Mr. Fengercroff, representing the technical interests of the German stockholders here.

(7) Barcelona to Sans; a mule line of 8 miles, running from the center of the city. This line has lately been purchased by German capitalists intending to introduce electric traction, but they are having some difficulty in obtaining a franchise, owing to the narrowness of streets through which they wish to run; and the objection of property holders to span wires and of the authorities to the poles. The company will probably be compelled to put down underground conduits in the city and trolley in the suburbs. No contracts have been let for this line nor has the chief engineer been appointed.

The only hindrances to the sale of American electrical goods in Spain, when the prices are the same as those of similar articles from other countries, are the higher duties levied on American imports than on those from nations under the "favored-nation clause," and, of course, there is a prejudice in favor of obtaining machinery and equipment, every thing else being equal, from the country of the principal shareholders. A direct line of steamers is now running monthly between New York and Barcelona.

PRACTICAL ELECTRICITY FOR EVERYBODY.

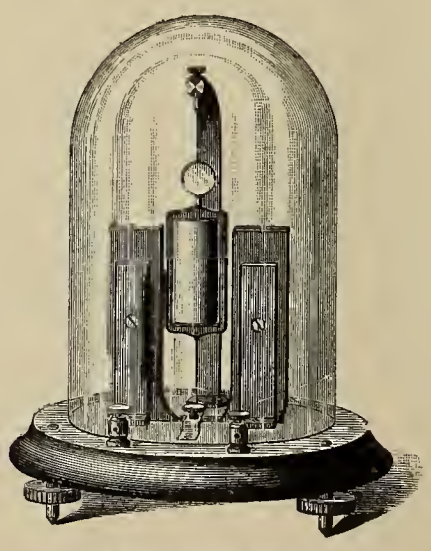
SPECIALLY PREPARED FOR STUDENTS AND ELECTRICIANS.

GALVANOMETERS.

A galvanometer consists essentially of a coil of wire and a magnet arranged in such a manner that the passage of a current in the coil moves either one or the other according to its adjustment.

The galvanometer may therefore be an instrument in which the coil is rigid and the magnetized needle free to move, or the needle fixed, in which case it would have to be very large and the coil movable.

An artificial magnetic field.—It is usual to supply galvanometers having one needle with an artificial magnetic field, that is, have an arched magnet capable of side and up and down adjustment placed over the galvanometer, for the purpose of neutralizing the magnetic field of the

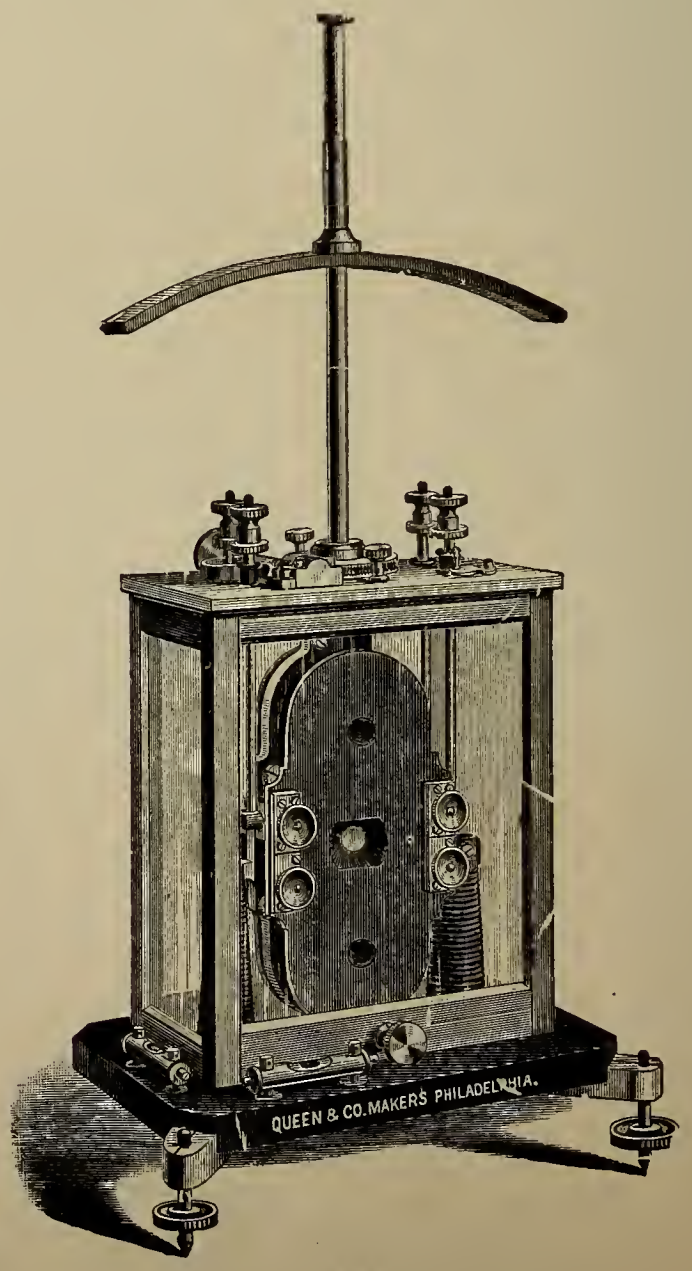


D'Arsonval Galvanometer.

earth, which would tend to drag upon the needle at times and destroy its sensitiveness.

To understand the use of this curved magnet, imagine a magnetized bar suspended by a cord in the air. The earth would tend to set it pointing north and south. This is due to the magnetic field of the earth. If this field is neutralized the bar will remain indifferently suspended, taking no particular position. A weaker force will then move it than before, so that if a small needle be considered that is being similarly treated, as in a galvanometer, it will take but a weak current to deflect it from its position. The arched magnet acts as a directive force if the galvanometer is "astatic."

The deflection of the needle is due to the effect of the magnetic field (produced by the coil when current flows through it) upon the needle.



Double Coil Astatic Galvanometer.

The more intense this field, the greater the twist or deflection of the needle. For the sak of convenience, heavy currents are measured in galvanometers of few

turns but large sized wire, and weak currents in galvanometers of many turns and fine sized wire.

The classification resulting is therefore—

Low resistance galvanometers,
High resistance galvanometers;

or, as they are sometimes called,

Short coil and
Long coil galvanometers.

It makes but little difference whether a heavy current of low pressure or a weak current of high pressure affects the needle, certain facts are common in either case.

(1). The delicacy of the galvanometer is dependent upon the method of suspension.

(2). Upon the strength of the coil.

(3). Upon its object.

As a rule the galvanometer in practice, either in laboratory or regular outdoor service, is made "astatic."

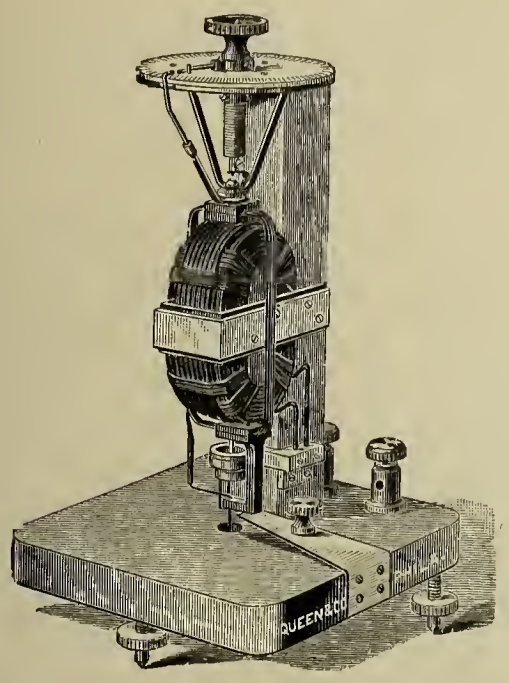
Astatic needles are merely two magnetized needles of equal strength placed upon a rigid bar, with opposite poles pointing in the same direction. One needle swings inside the coil, the other outside in unison with the first because of its permanent connection with it. A galvanometer may have as many pairs of needles as it has coils, or it may have one in each coil.

The two needles, being of equal strength, practically neutralize each other. The earth does not exert any directive influence over them any more than if they were of neutral metal.

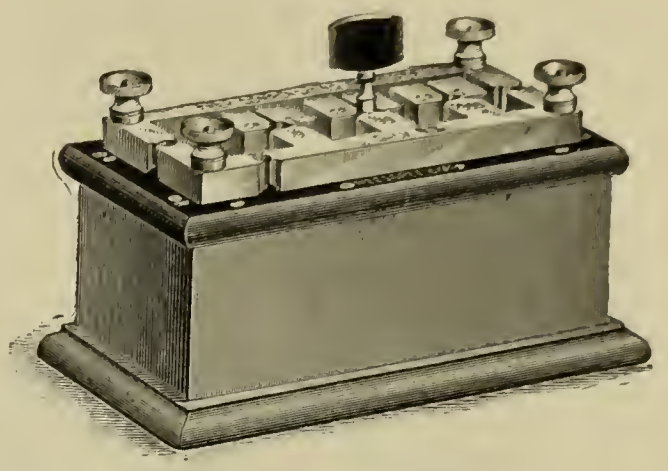
The arched magnet may supply an artificial field of greater or less strength as desired, by bringing it closer or further away from the coil.

A galvanometer constant is of consequence in determining the delicacy of the instrument.

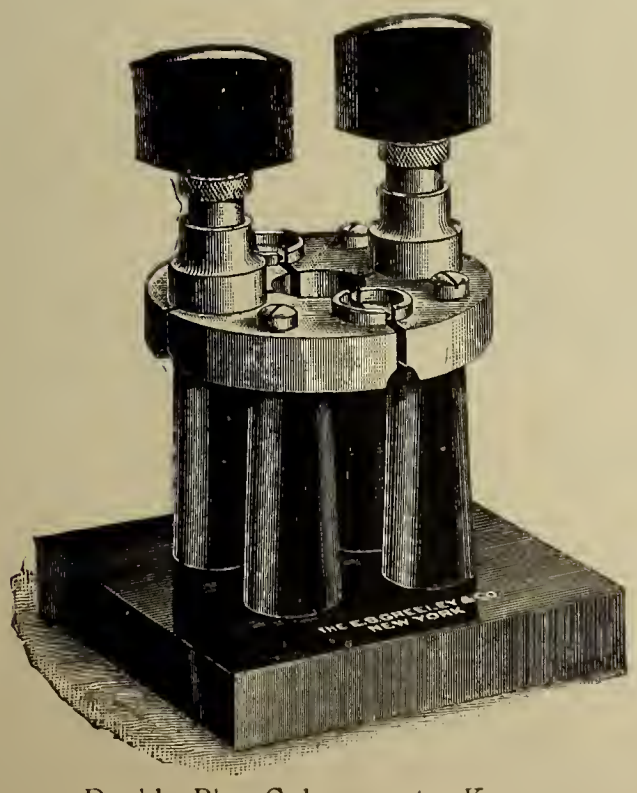
As a rule mirror reflecting galvanometers are in use for testing. They were invented by Lord Kelvin, of England, for receiving signals over the Atlantic cable—



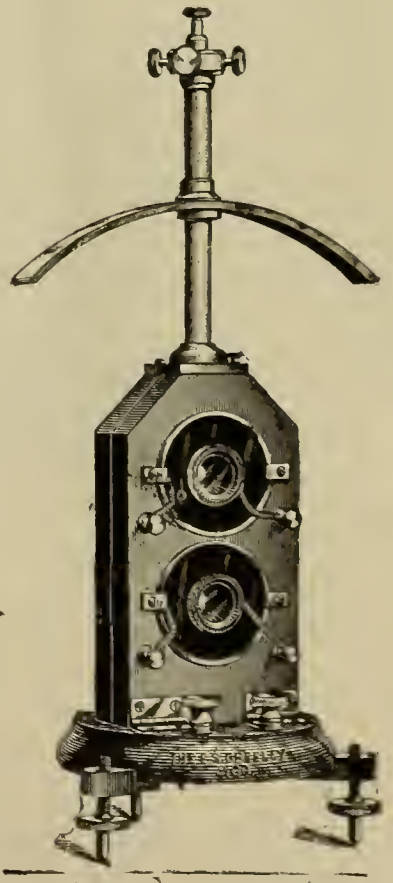
Dynamometer.



Galvanometer Shunts.



Double Plug Galvanometer Key,



[illegible] Galvanometer.

a small coil, within which swings a bit of magnetized watch-spring stuck to the back of a concave mirror about three-eighths of an inch in diameter. A beam of light strikes the mirror from a slit in a scale placed about three feet away. When the needle is at rest, the mirror reflects the spot of light on the middle of the scale. The least change in the coil makes the needle swing either to one side or the other. By this arrangement a pointer is dispensed with, the beam of light being its substitute.

In a mirror galvanometer the current and the deflection increase or decrease together in uniform proportion.

The constant, or figure of merit, of a galvanometer, is the amount of current required to produce a deflection of one divison on the scale.

It is found by connecting an adjustable resistance coil and a battery in series wth the galvanometer. The resistance must be added to until the spot of light marks one division. By applying Ohm's law the current flowing is easily found.

If volts of battery = 1,
Total ohms in circuit = 10,000,

the current flowing, therefore, = 1/10,000 = .0001 of an ampere. When one is divided by 10,000, Ohm's law is applied.

$$\text{Current} = \frac{\text{volts}}{\text{ohms}} = \frac{1}{10{,}000}.$$

One divison deflection is due to .0001 of an ampere, which is the figure of merit or constant.

A heavy current in a sensitive galvanometer would throw the spot of light off the scale.

An arrangement is used which divides the current up, so that only part enters the galvanometer; the rest passes away in what is called a "shunt."

A shunt takes only a certain amount of the current, as its construction calls for

9/10 of the current,
99/100 of the current,
999/1,000 of the current.

This is done by making the shunts of a resistance equal to 1/9, 1/99 and 1/999 of the resistance of the galvanometer coil.

The galvanometer and shunt then take an amount of current that can be determined Ohm's law. For instance, if a

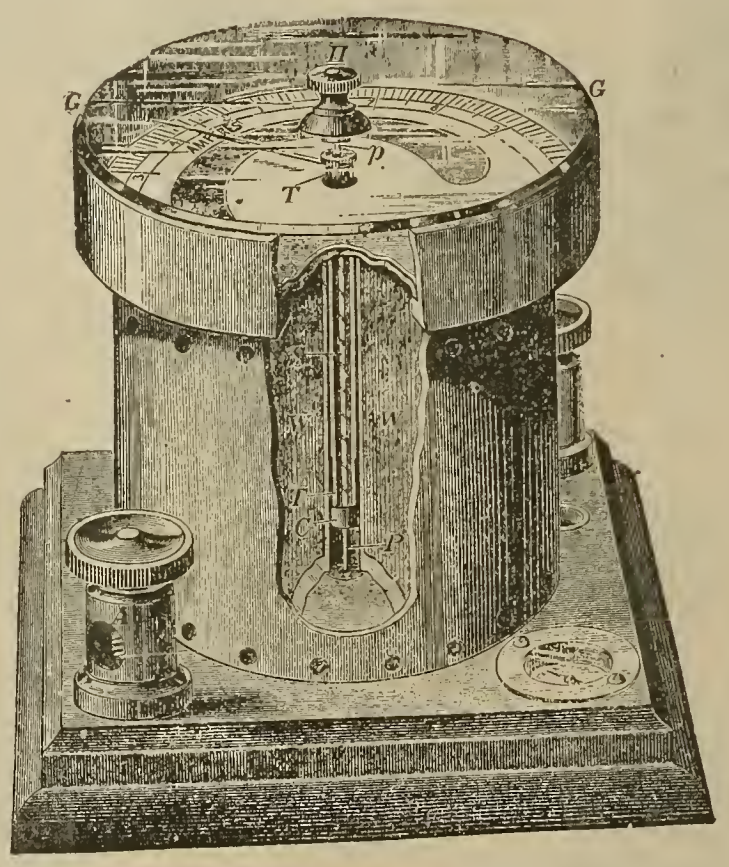
Galvanometer has 1 ohm resistance,
Shunt 1/9 of an ohm,

with a one-volt battery,

$$\text{the galvanometer would take } \frac{1 \text{ volt}}{1 \text{ ohm}} = 1 \text{ ampere};$$

$$\text{the shunt would take } \frac{1 \text{ volt}}{1/9 \text{ ohm}} = 9 \text{ amperes}$$

Total, 10 amperes.



Hot Wire Ammeter.

Out of a total of 10 amperes the galvanometer takes 1 and the shunt 9; therefore the shunt, having 1/9 the resistance of the galvanometer to which it is connected, takes 9/10 of the current.

Galvanometers serving various purposes are named as follows:

Tangent galvanometers,
Sine galvanometers,
Astatic galvanometers,
D'Arsonval galvanometers,
Ballistic galvanometers.

The Weston instruments are patterned after the D'Arsonval galvanometer.

The detection and measurement of the current and pressure lie within the field of the galvanometer. For the measurement of resistance another department is required, that is vast in its extent and of the greatest importance.

The Pan-American Exposition.

BIRDSEYE VIEW OF THE GREAT GROUP OF SPLENDID ARCHITECTURAL WORKS.

It is promised for the Pan-American Exposition that it will surpass in beauty any previous exposition in the world's history. It is also expected that it will outrival its predecessors in many other ways, for at no time have such wondrous achievements in all arts, such perfection in the hundreds of trades been attained. Accompanying this article is a birdseye view of the Exposition plot, showing the magnificent work in its completed state. The view is from the south and shows an area one mile and a quarter long and half a mile wide, there being 350 acres in the enclosure. In the immedite foreground is a proach, just north of the lake, the eye follows northward between two rows of ornamental columns to what is known as the Forecourt. East of this are the State and Foreign buildings forming in themselves a very interesting feature of the Exposition. Near these, also, are the buildings for the special ordnance displays representing the products of several hundred manufactories in this line of work. West of the Forecourt will be the outdoor horticultural displays and the Woman's Building. We cross now the Triumphal Bridge which will be remarkable for its tall piers richly ornamented with statuary ,the product of the genius of Karl Bitter, the Director of Sculpture, and other famous sculptors.. On either side are the Mirror Lakes which form a part of the Grand Canal, more than a mile in length, which surrounds the main group of buildings. We come next to the Espla-



portion of Delaware Park. The view shows the Park Lake with the North Bay at the left and in the left foreground south of the bay may be seen a portion of the Albright Gallery of Art. North of the bay is the New York State Building. These two buildings are in the style of Greek temples, one containing reminders of the Parthenon and the other resembling somewhat the Erechtheum upon the Acropolis at Athens.

Between the North Bay and the Lake is the Bridge of the Three Americas. On the northern shore of the lake is situated the lifesaving station erected by the Federal Government where daily exhibitions will be given by a crew of ten men showing the uses of modern life-saving apparatus as employed upon our coasts.

The symmetrical grouping of buildings will be at once noted by the observer. Beginning at the formal approach, just north of the lake, the eye follows northward between two rows of ornamental columns to what is known as the Forecourt. East of this are the State and Foreign buildings forming in themselves a very interesting feature of the Exposition. Near these, also, are the buildings for the special ordnance displays representing the products of several hundred manufactories in this line of work. West of the Forecourt will be the outdoor horticultural displays and the Woman's Building. We cross now the Triumphal Bridge which will be remarkable for its tall piers richly ornamented with statuary ,the product of the genius of Karl Bitter, the Director of Sculpture, and other famous sculptors.. On either side are the Mirror Lakes which form a part of the Grand Canal, more than a mile in length, which surrounds the main group of buildings. We come next to the Esplanade, which is nearly two-fifths of a mile long and 450 feet wide. The western end of the Esplanade is enclosed by the Horticulture, Graphic Arts and Mines buildings. The eastern end is shut in by the government group of three large buildings. Sunken gardens with elaborate fountains and many groups of sculpture occupy the two arms of the Esplanade and the decorative features throughout this broad space are very numerous and beautiful. North of the Esplanade is the Court of Fountains, with the Ethnology Building on the right and the Music Building on the left. Two subordinate courts also open into the Esplanade from the north, the one on the right being known as the Court of Cypresses and the one on the left as the Court of Lilies. Next, north of the Ethnology Building on the right and fronting upon the Court of Fountains is the Manufactures and Liberal

Arts Building and on the opposite side the Machinery and Transportation Building. In the Court of Fountains is a large pool, having an area of about two acres and containing many beautiful fountains. Proceeding again northward we come to the Mall, a broad avenue, half a mile lone extending from the eastern boundary to the western gate of the Exposition. Fronting upon the Mall on the right is the Agriculture Building and on the left the Electricity Building. We now arrive at the most conspicuous feature of the Exposition, the massive Electric Tower, 391 feet in height. This tower stands between the Court of Fountains and the Plaza, in a broad pool, about two acres in extent. This will be the most ornamental feature of the great Exposition and will be the centerpiece for special and elaborate electrical illumination. Immediately north of the Electric Tower is the Plaza, with its beautiful sunken garden and bandstand in the center, the Propylasa or monumental entrances at the north, the entrance to the Stadium on the east and the entrance to the Midway on the west.

At night all the buildings will glow with the soft radiance of thousands of electric lights, making a scene of unrivaled brilliance and splendor. More than 200,000 lamps will be used in the electrical illumination.

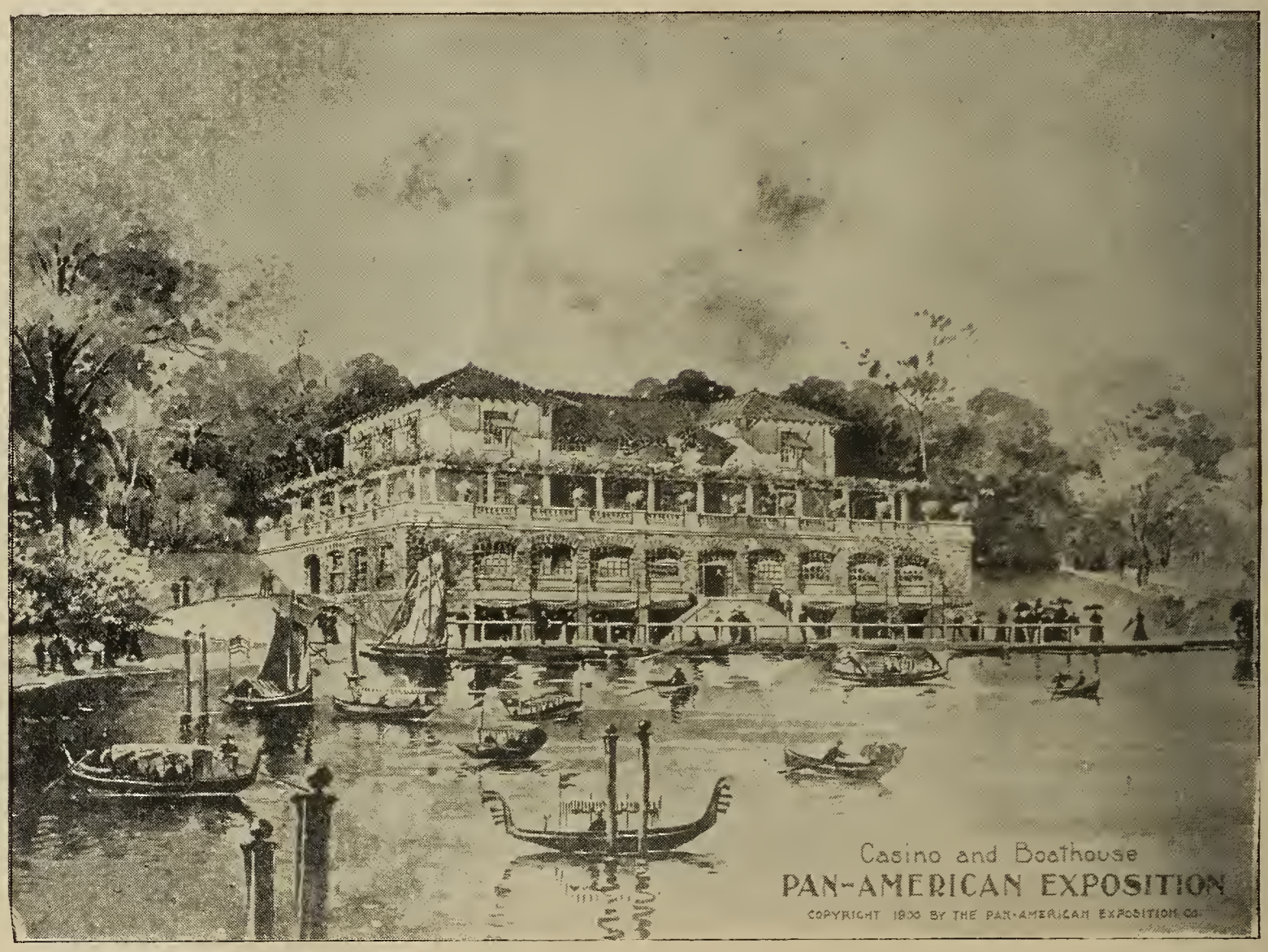
The power for Exposition uses is furnished principally from Niagara Falls, which are situated only a few minutes' ride from the Exposition grounds. Buffalo is a city of nearly 400,000 population and is preparing in every possible way for the reception of millions of visitors in 1901.

CASINO AND BOAT HOUSE.

The new Casino and Boat House on the south bank of the Delaware Park Lake, a little to the east of the Bridge of the Three Americas, is in a sense a tribute paid to the Pan-American Exposition by the city of Buffalo, though it will be of service for many years after the Exposition has become history. It is a very attractive building, with many conveniences which will be greatly appreciated by visitors.

The first or basement story is built with Buffalo Plains limestone, very rustic in character and decidedly picturesque. In this story will be a restaurant and lounging room. A corridor extends through the entire length of this story of the building, affording ample room for the storage of bicycles, and other uses. The basement story will be surmounted by a balustrade of Indiana limestone with turned balusters. Over a large portion of this story will be an open terrace covered by a pergola. Perhaps the term peristyle would best describe this part of the structure. The columns introduced here are free Doric. The terrace will be of concrete construction, with granolithic floors. The building material above the basement story and aside from the terrace will be white bricks, with a roof of rich red Spanish tiles. The second story will be devoted to amusements, and the third story will be occupied as living rooms by the lessee of the building.

Underneath the basement story is the place of storage for boats during the winter, and extending out over the water is a boat platform, 128 feet long and 22 feet wide.



The building covers an aera of 109 by 73 feet. Its cost is $30,000.

JOHNSTOWN FLOOD.

The most vivid scenes of the Johnstown flood, the accounts of which at the time of the appalling catastrophe electrified the entire civilized world, will be presented in a startlingly realistic manner by means of the scenograph at the Pan-American Exposition. The descriptions of



eye witnesses have been followed faithfully by the artist in the portrayal of the scenes. The presentation, like the experiences of the survivors of the flood, is never to be forgotten by those who witness it.

The curtain rises upon the city of Johnstown as it was before the devastating flood. It is the even-tide, and the streets are alive with people wending their homeward ways. A passenger train of the Pennsylvania Railroad, in the foreground, dashes past. The sun sinks behind the western hills, and as the shadows envelop the town the lights begin to appear in the windows of the houses. Furnaces and coke ovens in the distance light up the heavens, giving a startling spectacular effect. A trolley car mounts the hill to the south. The lights in the houses disappear and the city sleeps. The sun rises over the hill-tops and throws its long bars across the scene. Johnstown is again alive. Gradually clouds gather in the sky and some rain begins to fall, slowly at first, then in torrents, accompanied by thunder and lightning. Suddenly the great dam at South Fork, up the Little Conemaugh, to the east, breaks with the tremendous force against it and the water rushes down upon the town, carrying everything before it. The citizens are taken by surprise and many are drowned in the raging torrent. The flood stops at the stone bridge, when the debris piles up and holds the water back. The darkness grows more dense, and soon fire adds its horrors to the scene. All this is brought out very effectively by the scenograph. Finally the scene changes, and the Johnstown of to-day is shown, a busy, thriving town.

Business News.

NEW INCORPORATIONS.

Indianapolis, Ind.—Merchants of Dana have incorporated the Indiana Electric Company for $3,500.

Vicksburg, Miss.—A charter has been granted to the Southern Light and Power Company, of Vicksburg, with a capital of $100,000.

Chicago, Ill.—The National Manufacturing and Electric Company, of Assumption, has been granted a charter with a capital of $25,000.

Camden, N. J.—The New Jersey Light, Heat and Power Company was incorporated at Trenton, on November 28, with a capital stock of $200,000, to furnish electric light, heat and power.

Natchez, Miss.—A charter has been granted to the Natchez Electric Street Railway and Power Company, which is capitalized at $15,000. Local capital is heavily interested.

Albany, N. Y.—New York city capitalists have incorporated the Whitehall Gas and Electric Company for $50,000 to supply gas and electricity for light and heat.

Albany, N. Y.—The Hamburg Electric Land Company, of Buffalo, was incorporated on December 6. Its capital is $7,770 and its incorporators are all Rochester capitalists.

New Brunswick, N. J.—Incorporation articles were recently granted to the New York Electric Supply Company, which was capitalized at $50,000. The new corporation will have an office at Carteret.

Albany, N. Y.—Incorporation articles have been granted to the Waterford Electric Light, Heat and Power Company, capitalized at $50,000, to do business in Waterford, Schaghticoke, Stillwater and other towns in the vicinity.

Trenton, N. J.—A charter has been granted to the Transcendent Light Company, of Jersey City, to furnish light, heat and power. The capital stock is $300,000, furnished by New York and Jersey City interests.

Lansing, Mich.—An increase of $30,000 to its capital stock has been certified by the Wolverine Motor Works, of Grand Rapids. On December 2, charters were granted to the Toledo, Adrian & Jackson Railway Company, of Toledo, Ohio, capitalized at $70,000, and the Low Water Electric Alarm Company, of Detroit, $25,000 capital stock.

New York City.—G. R. Gray Company was incorporated on December 7 for $5,000 to do a general electric equipment business, and on the same date in Wilmington, Del., a charter was granted to the United Electric Light and Power Company, also of New York, to furnish electric light, heat and power. The latter company's capital stock is $1,500,000.

TELEPHONE CALLS.

Indianapolis, Ind.—A recent incorporation is that of the Pennville Telephone Company, with a capital of $2,000.

Kansas City, Mo.—A charter has been granted to the El Dorado Springs Telephone Company, which is capitalized at $10,000.

Harrisburg, Pa.—Corporation articles have been granted to the Juniata & Susquehanna Telephone Company. The capital stock is $1,000.

Indianapolis, Ind.—Vermilion County capitalists have incorporated the Indiana Electric Company, with a capital stock of $13,500, to operate telephone lines in Indiana and Illinois.

Austin, Tex.—A charter has been granted to the Bryan Telephone Company, which is capitalized at $12,000, to operate in Brazos, Burleson, Robertson, Madison and Leon counties.

Jefferson City, Mo.—A charter was granted on November 30 to the Sikeston Telephone Company, with a capital of $12,000, and the Saline County Telephone Company increased its capital stock by $10,000.

ELECTRIC RAILWAY NEWS.

Augusta, Me.—A charter has been granted to the Lewiston, Winthrop & Augusta Street Railway Company, with a capital stock of $160,000.

Pueblo, Colo.—The Colorado Springs Electric Company, to construct and operate electric lines, has been capitalized at $1,000,000 by local investors.

Augusta, Me.—The York County Railroad Company was incorporated on December 3 at Augusta, for $250,000. This amount will be divided into 2,500 shares of common stock.

McKeesport, Pa.—A press despatch states that the McKeesport, Wilmerding & Duquesne Street Railway, and the Yoghioghany Valley Traction Company have been absorbed by the Monongahela Street Railway Company for $600,000.

Springfield, Ohio.—Articles of incorporation have been issued for the Little Miami Traction Company, whose capital stock is $50,000. This will eventually be increased to $2,500,000, and a railway will be built from Springfield to Cincinnati, touching several intermediate points.

Boston, Mass.—A hearing was given to the proposition of the Pembrook street railway for authority to issue $270,000 in first mortgage bonds to retire the bonded indebtedness of the Plymouth & Kingston Street Railway, which it absorbed, and to issue $80,000 additional capital stock. No opposition was manifested and the matter was favorably reported upon.

New Brunswick, N. J.—Andrew Radel, prominent in the Middlesex-Somerset Traction Company, has recently purchased the Akron & Cuyahoga Falls Rapid Transit Railroad, of Ohio, and expects to spend about $25,000 in improving and extending the system. Mr. Radel refused to name the purchase price, but it is believed it reaches well up into the hundred thousands.

Lansing, Mich.—Incorporation articles have been granted to the Pontiac & Flint Electric Railway Company, which is capitalized at $50,000. Minnesota and Michigan capital is interested. The object of incorporation is to construct an electric road 32 miles in length from Pontiac to Flint to connect with the Saginaw Suburban, now in process of construction.

Newark, N.J.—A consolidation of the trolley companies in Elizabeth, Rahway and Plainfield, excepting only the North Jersey Street Railway Company's system in Elizabeth, has been effected. The new corporation will be known as the Elizabeth, Plainfield & Central Jersey Railway Company, with a capital stock of $3,000,000. A bond issue of $2,500,000 has been authorized to provide for extension of the system. The president of the new company is David Young, of the North Jersey Street Railway Company; vice-president, Thomas A. Nevins, of Orange; treasurer, Thomas N. McCarter, and secretary, Colonel Edwin W. Hine, of Orange The companies included in the consolidation are: The Westfield & Elizabeth Street Railway Company, the Elizabeth City Horse Railroad Company, the Elizabeth Street Railway Company, the Plainfield Street Railway Company and the Rahway Street Railroad Company. The lines extend, with branches, to Dunellen, Westfield, Rahway, Boynton Beach, Plainfield, Roselle, Scotch Plains and North Plainfield. Both of the Elizabeth companies were owned by United States Senator John Kean, whose interests are bought outright by the new corporation. Of the $2,500,000 bond issue, $1,500,000 will apply to the purchase of the Kean interests and those of the Rahway company. The rest will be spent in improvements and extensions to the system. Among the extensions projected are lines to connect Cranford, Springfield and Millburn. It is said through cars will soon be run between Newark and Plainfield.

AUTOMOBILES.

Trenton, N. J.—New York capital is interested in the Keystone Wagon and Automobile Company, which has been incorporated in this city for $100,000.

Springfield, Mass.—A recent incorporation under Maine law is that of the Skene American Automobile Company, whose capital stock is $500,000, $250,000 of which is paid in.

Detroit, Mich.— A new automobile company has been chartered in this city and will operate as the Rambler Cycle and Automobile Company. The charter calls for a capital of $25,000.

BUSINESS CHANGES.

Medina, N. Y.—Augustus H. Vanderpoel has been appointed permanent receiver of the Medina Gas and Electric Light Company, in proceedings for the dissolution of that corporation.

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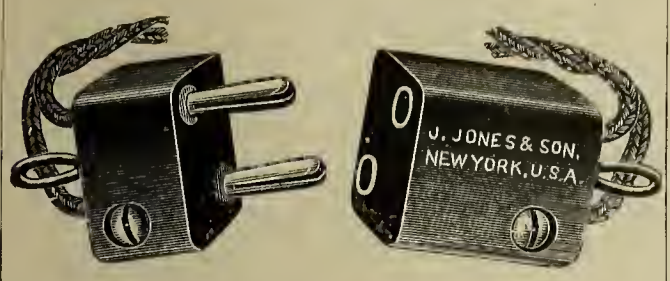


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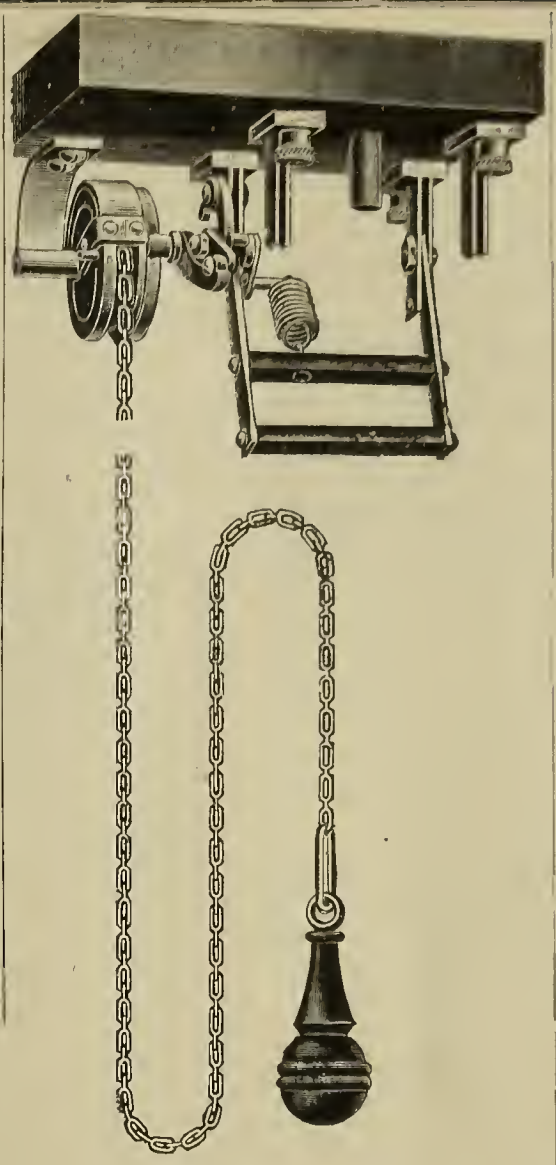
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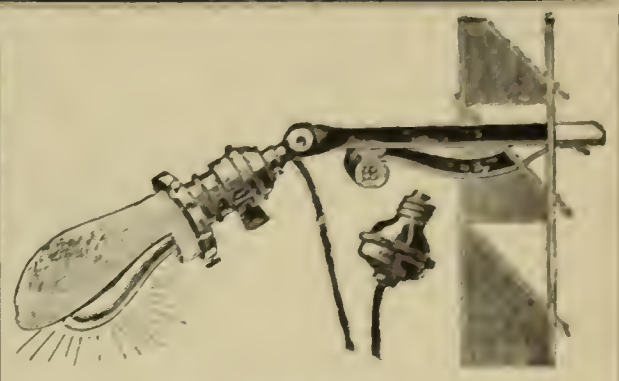
BERLIN. European Weston Electrical Instrument Co., Ritterstrasse No. 89
LONDON. Elliott Brothers No. 101 St. Martins Lane



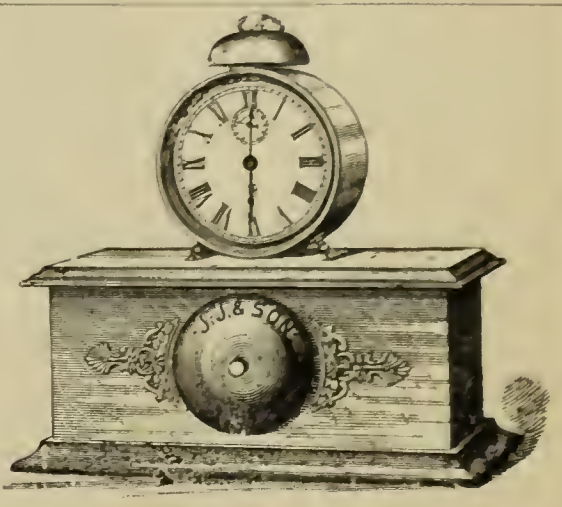
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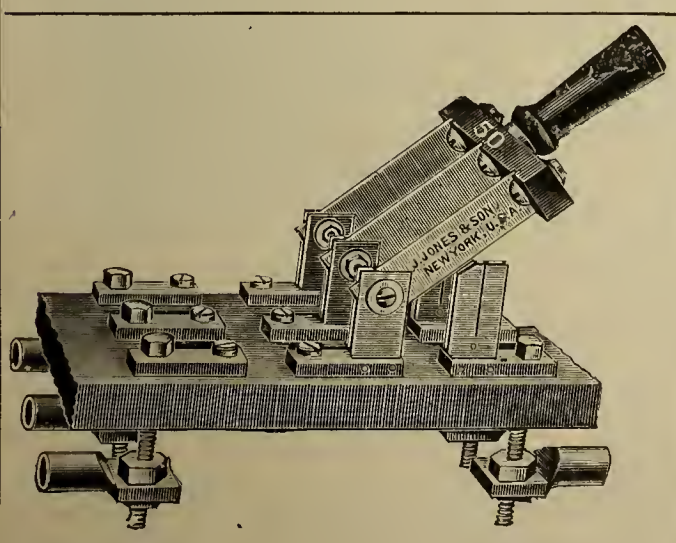
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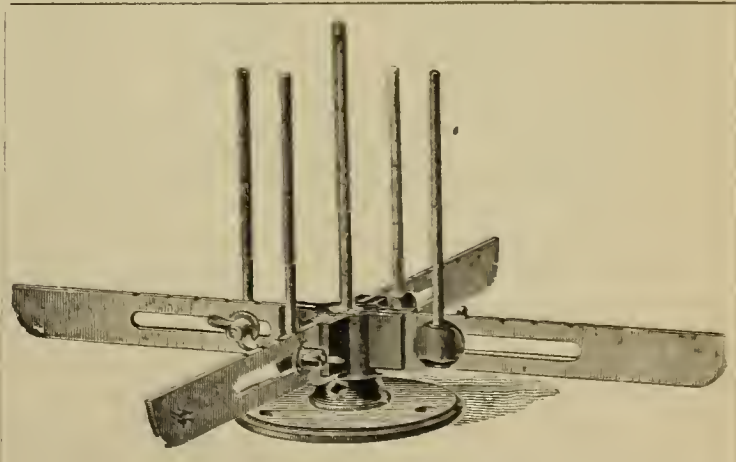


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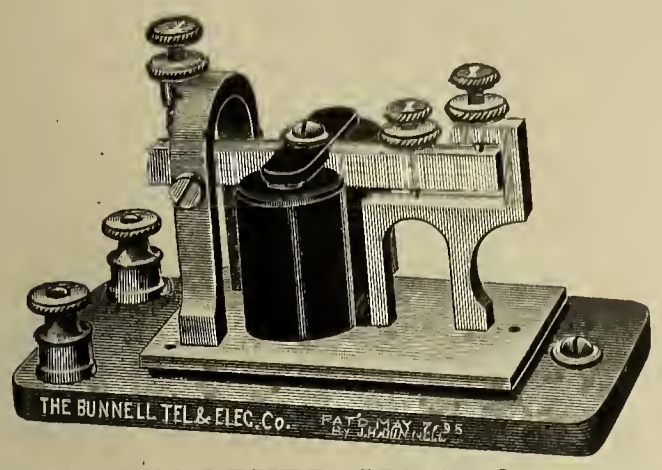
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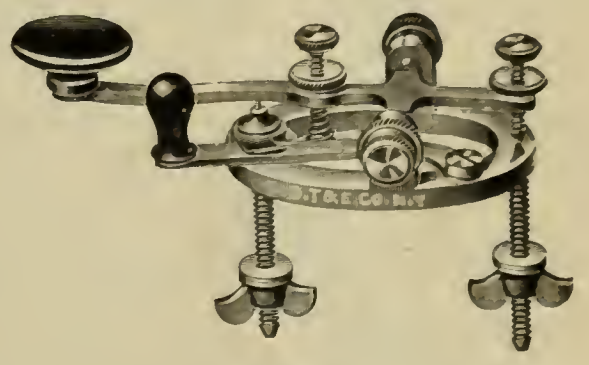
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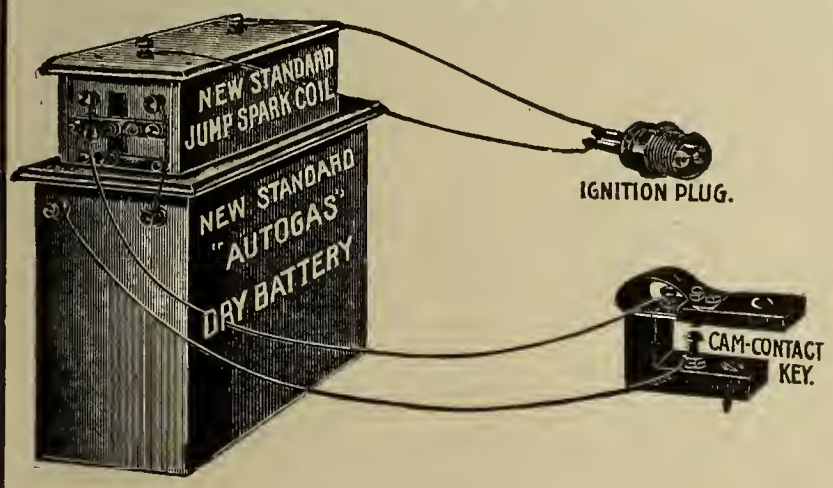
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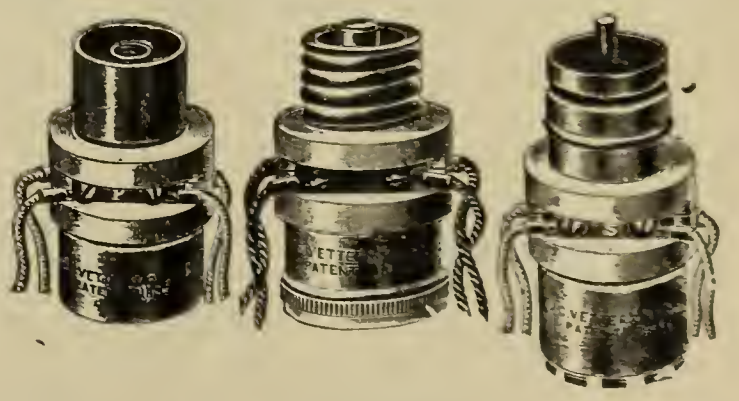
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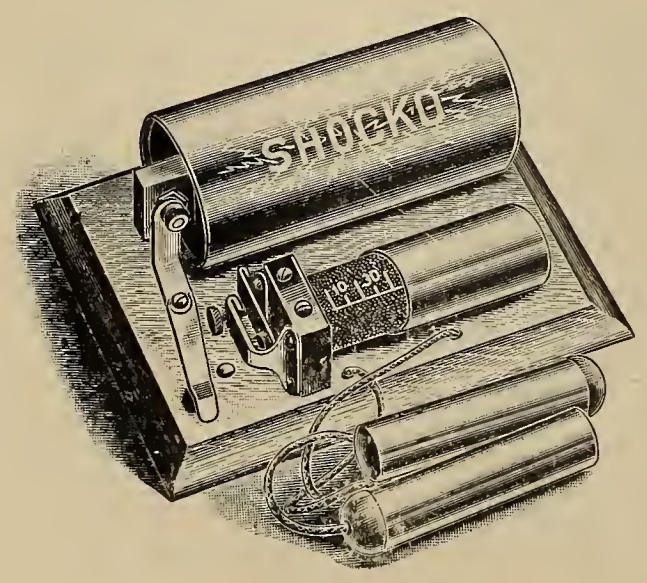
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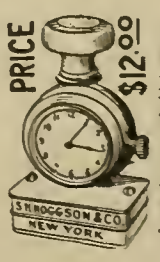
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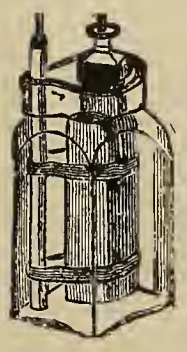
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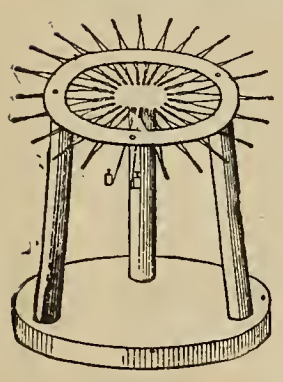
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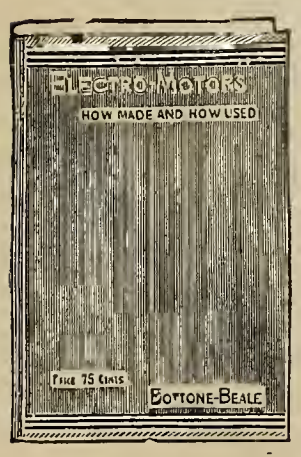
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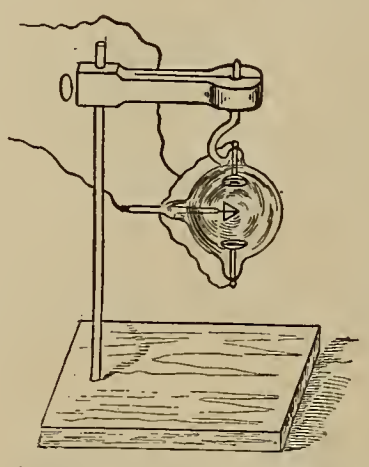


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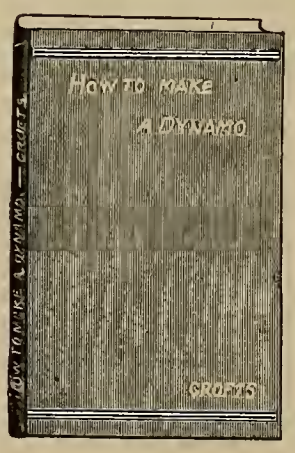
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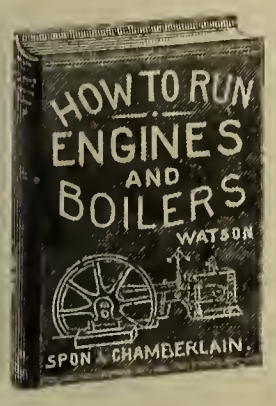
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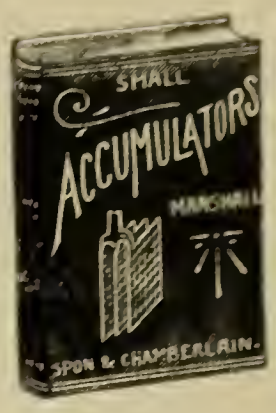
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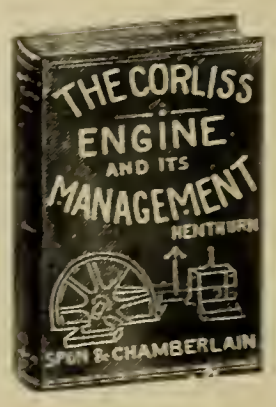
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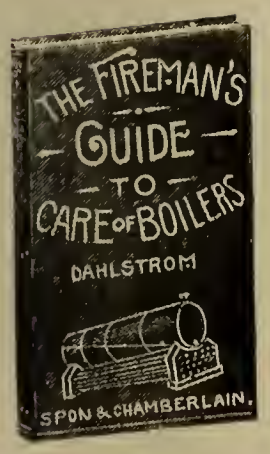
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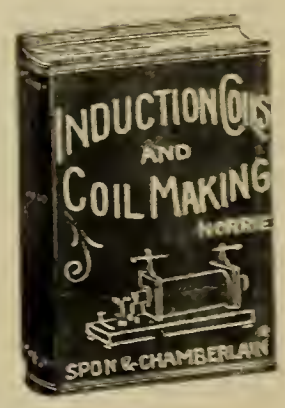
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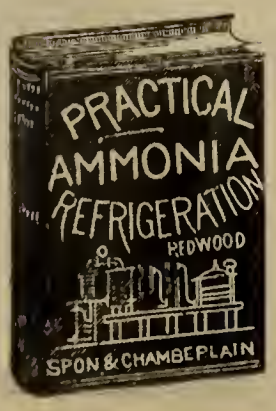
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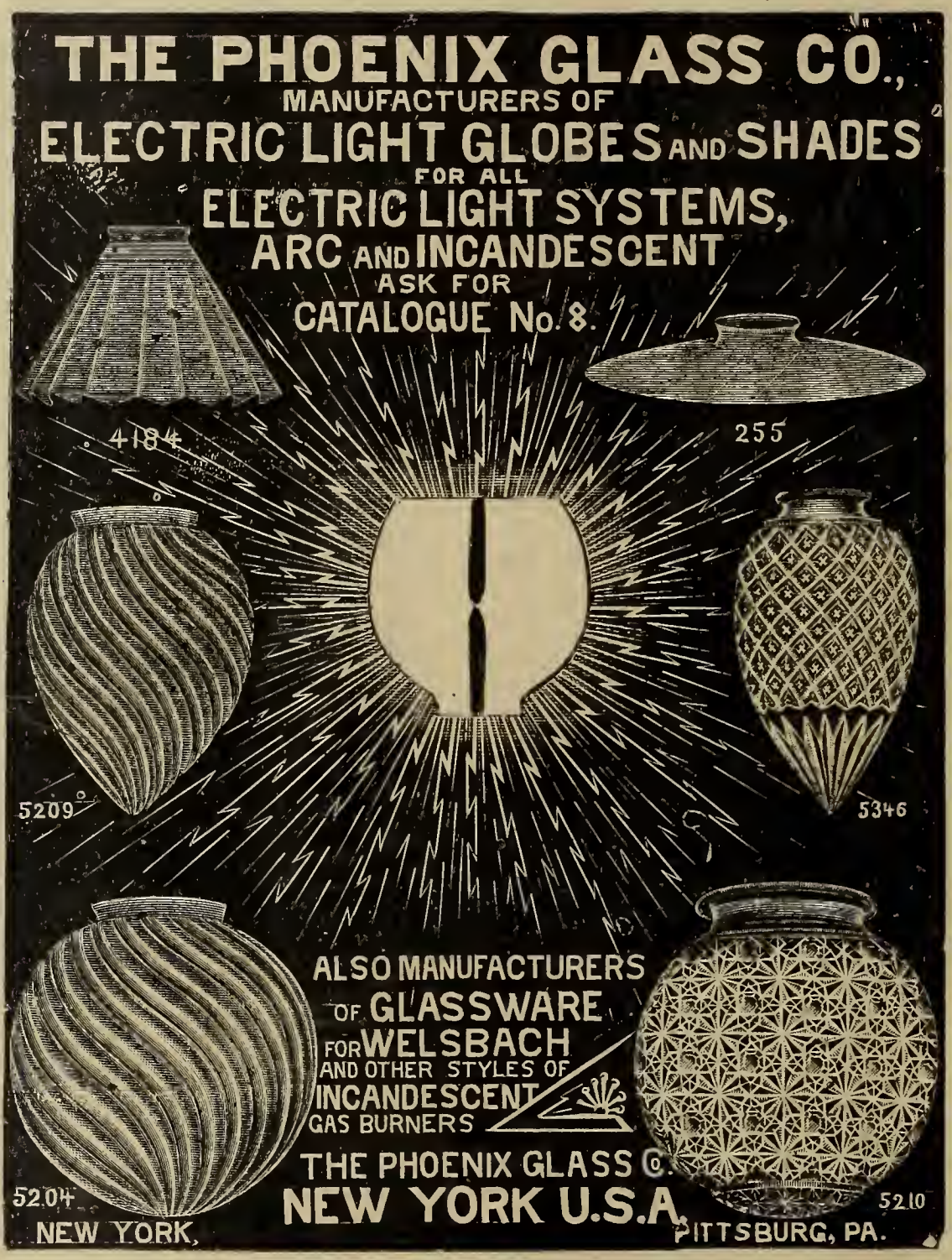
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